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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

1912.

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Errata.

Page 76, line 22 from top, *for* 150,00 cubic feet *read* 150,000 board feet.

Page 78, line 15 from top, *for* eastern *read* western, and *for* north-eastern *read* north-western.

Page 170, line 18 from top, *for* Georgetown *read* Kingstown.

Page 171, line 3 from bottom, *for dilatatum read conjugatum.*

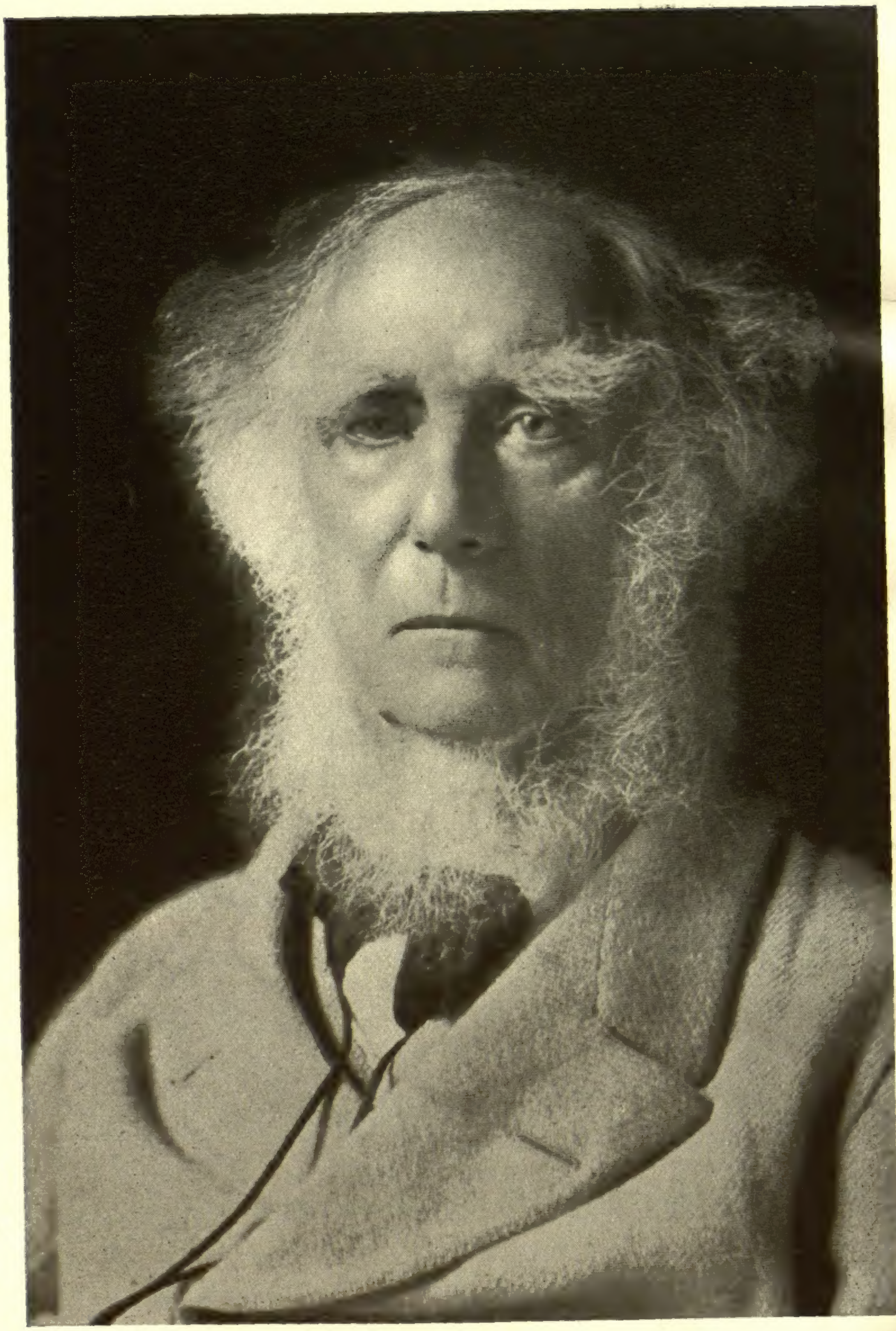
Page 172, line 6 from top, *for* mortelles *read* Immortelles.

Page 173, first line, *for* 1500 *read* 600.

Page 200, line 17 from bottom, *for* **Wilkstroemia** *read* **Wikstroemia.**

Page 300, lines 4 and 5 from bottom, *for* Assistant Superintendent *read* Superintendent.

Page 378, line 22 from top, *for Alipinia* read *Alpinia.*



[*Elliott & Fry, Ltd.*

Sir JOSEPH DALTON HOOKER, O.M.

To face p. 1.]

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No. 1.] [1912.

I.—SIR JOSEPH DALTON HOOKER.

1817–1911.

Kew lies, at the beginning of the year, under the shadow of a great sorrow. The veteran Sir Joseph Hooker, Assistant Director during the decade 1855–1865 and Director in the two decades 1865–1885, died at his residence, The Camp, near Sunningdale, in his ninety-fifth year, at midnight on Sunday, 10th December, 1911.

Born at Halesworth in Suffolk on 30th June, 1817, Joseph Dalton Hooker was the second son of William Jackson Hooker and his wife Maria Sarah, eldest daughter of Mr. Dawson Turner, F.R.S., Norwich. His father, at the time of Hooker's birth, was the managing partner of a business which he had been induced to enter in 1809 along with Mr. Turner, whose daughter he married in 1815, and Mr. Paget of Yarmouth, father of the late Sir James Paget, Bart. To so enthusiastic a naturalist and author as the elder Hooker the occupation at Halesworth was not altogether congenial. Towards the end of 1819 he expressed to his friend Sir Joseph Banks a desire to find some position in which his already remarkable and extensive knowledge of botany could be turned to account. Sir Joseph Banks suggested as a suitable situation the Professorship of Botany in the University of Glasgow, which had just become vacant. Hooker's father accepted this suggestion, and in February, 1820, he was appointed by the Crown to the Glasgow chair in succession to Professor Graham, who had been transferred to Edinburgh. He entered upon his duties in May, and the impression which he created may perhaps be best estimated by a remark made in July by Francis Hamilton, one of the ablest and shrewdest men of his time, regarding "the Botanical Garden at Glasgow, where there has been lately appointed a professor likely to be somewhat distinguished." Professor W. J. Hooker occupied the Glasgow chair until 1841, when he was appointed Director of the Royal Gardens, Kew. His son Joseph was therefore educated in Glasgow, passing through the High School to the University, where he attended some of the classes in the Faculty of Arts before proceeding to those in the Medical

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Faculty. In the mathematical class he had as a fellow student a lad somewhat younger than himself, son of a colleague of his father, afterwards to become Lord Kelvin and to follow himself as occupant of the chair of President of the Royal Society. As a medical student he had as a class-fellow the son of another colleague of his father destined like himself to become a distinguished traveller and to be his companion on some of his own most interesting and fruitful journeys. Hooker completed his medical studies and obtained the degree of M.D. at Glasgow in 1839.

While an undergraduate in Glasgow much of Hooker's spare time was given to work in his father's herbarium; his reading, as he himself has explained, included the study of many works of travel. Among the passages, he tells us, which had especially impressed him were Turner's description of the great peak of Chumlari in the Eastern Himalaya and the account of the island of Kerguelen contained in Cook's Voyages. The latter he was destined to visit himself quite early in his career. At the close of his medical curriculum Hooker became an Assistant Surgeon in the Royal Navy and was gazetted to the "Erebus," then about to start, in company with the "Terror," on an Antarctic expedition under the command of Sir James Clark Ross. In this expedition Hooker held the position of botanist, and in that capacity he was enabled during the next three years to visit New Zealand, Australia, Tasmania, Kerguelen, Tierra del Fuego, and the Falkland Islands. Keen and assiduous, he managed to bring together very large collections of material and to acquire an extraordinary amount of botanical information. While at work on his father's collections, Hooker made his earliest contribution to botanical literature; descriptions by him of three new Mosses from the Himalaya were published in the 'Icones Plantarum' in 1837 (vol. ii. p. 194). Before starting on the Antarctic voyage, he had prepared in collaboration with Professor Harvey another paper on Indian Mosses. This, his second publication, appeared in 1840, while he was absent in the southern seas. But if, under paternal inspiration, Hooker thus showed an early inclination for the study of Cryptogams, he would appear to have simultaneously developed an interest of his own in Fossil Botany, because an early contribution to natural knowledge, written and published in Tasmania in 1842 while he was botanist to the circumpolar expedition, gives the results of the examination of specimens of fossil wood from the Macquarie Plains.

Shortly after his return from the Antarctic expedition Hooker, in 1843, became Assistant to Graham, who was still Professor of Botany in Edinburgh and held this position until 1845 when Graham was succeeded in the chair by the elder Balfour. On the termination of his appointment at Edinburgh Hooker became botanist to the Geological Survey of Great Britain. This new appointment naturally gave a great impetus to his palaeontological interests: while attached to the Survey he made a number of important contributions to the literature of Fossil Botany, the most notable of these being a discussion of the vegetation of the Carboniferous period as compared with that now existing on the globe, which appeared in 1848. But his studies during the period of his appointment in Edinburgh and of his attachment to the Geological Survey

were very far from being confined to palaeobotany. Immediately after his return from the long voyage in the "Erebus," Hooker began the arduous task of preparing for publication the scientific results of his researches in the field. Still under the influence of his early predilection for the study of Cryptogams, he published between 1844 and 1847, sometimes alone, sometimes in collaboration with well-known authorities who had made a special study of particular families, a series of important papers on the hepatics, lichens, mosses, and algae of the subantarctic regions. Nor was this all that he was able to accomplish during the period between 1843 and 1847; in or prior to the latter year he collaborated with his father in work on the botany of the Niger expedition, published an enumeration of the plants of the Galapagos Archipelago, and, in conjunction with Mr. Bentham, prepared the manuscript of the Flora Nigritiana, incorporated by Sir W. J. Hooker in his 'Niger Flora' which appeared in 1849. Meanwhile the elaboration of the general antarctic results, the publication of which had begun in 1844, went on steadily, and in 1847 the first section of these results was completed and published in two quarto volumes under the title 'Flora Antarctica.'

With the appearance of this work, however, the task was temporarily relinquished, and Hooker's duties as botanist to the Geological Survey came to an end, in order that he might undertake another expedition more arduous even than the last. The object in view was a double one. His desire was to add to the knowledge already acquired at first hand with regard to the vegetation of temperate and subantarctic regions a corresponding knowledge of the vegetation of some tropical region; and at the same time to acquire an acquaintance with the vegetation of some large continent commensurate with his knowledge of the floras of so many insular regions. The field of study selected was North-Eastern India, a tract in which but little botanical exploration had been done. The expedition was at first intended to be a private enterprise; during the course of the preliminary preparations, however, the project was so fortunate as to receive official recognition and to be partly subsidised from public funds. The amount of the subsidy was small, but the indirect effect of the recognition was great, and Hooker found as a consequence that what might otherwise have been difficult became comparatively easy; indeed some of the results he was able to attain might otherwise have proved impossible of accomplishment. Hooker left England in November, 1847, travelling part of the way as one of the suite of Lord Dalhousie, then proceeding to India to assume the position of Viceroy; from His Excellency, who took the closest personal interest in the undertaking, Hooker received continued encouragement and constant assistance. Reaching India in January, 1848, Hooker devoted the first three months of the year to journeys in the Gangetic Plain and in Behar, ascending the sacred mountain of Parasnath in Chutia Nagpur. From Behar he made his way to the Himalayas and reached Darjeeling, which became his base of operations, about the middle of April. What remained of the year 1848 and practically the whole of the year 1849 were occupied in the botanical exploration and topographical survey of the State of Sikkim and of the

passes which lead thence into Tibet. While on these high wind-swept passes he was able at least to see, even if he did not reach, that glorious peak of Chumlari which had, from Turner's description, so kindled his boyish ardour to travel. A fortunate accident had gained for him the acquaintance of the great Jung Bahadur; thanks to this, Hooker was given an opportunity, which no one has enjoyed since, of spending the latter part of 1848 in similarly exploring some of the valleys of Eastern Nepal. During most of his sojourn in the Himalayas Hooker travelled and surveyed unaccompanied by any European. But in October, 1849, his friend Dr. Campbell, then the Superintendent of Darjeeling, obtained official permission to visit native Sikkim and joined Hooker. Shortly afterwards the Sikkim Ministry decided that this was an excellent opportunity to take of showing discourtesy to the Indian Government. This discourtesy assumed the form of seizing and maltreating Campbell; Hooker, who was at the same time made a prisoner, they refrained from injuring. Towards the end of December, 1849, the captives were released and the next three months were spent by Hooker in Darjeeling closely occupied in the task of arranging his huge collections and in that of reducing, with the aid of a number of devoted Anglo-Indian friends, the observations made during his survey of the country.

Hooker's old schoolmate and fellow student, Dr. Thomas Thomson, son of one of his father's colleagues in the University of Glasgow, had joined the Indian Medical Service when Hooker entered the Royal Navy. Early in 1847, Lord Hardinge, then Viceroy of India, had deputed Thomson to carry out exploration work in the North-west Himalaya and in Western Tibet, similar to that on which Hooker was engaged in Sikkim. This task completed, Thomson had been accorded permission to proceed to Darjeeling in order to join Hooker. The two friends devoted the year 1850 to a joint botanical investigation of Eastern Bengal, the Sundribuns, Chittagong, Silhet and the Khasia Hills.

Some of the results of Hooker's Indian observations were published by the Asiatic Society of Bengal while he was in India. On his return to England in 1851, he at once resumed work on the materials of his antarctic voyage, the second section of his great work, again in two quarto volumes, being completed in 1855, under the subsidiary title 'Flora Novae Zelandiae.' But while engaged on this and on the subsequent section of the same work, the opening part of which was also issued in 1855, Hooker simultaneously took in hand, largely in collaboration with his friend Thomson, the elaboration of their Indian material. Two very fine illustrated folios dealing with Himalayan species appeared. The first of these, dealing with the Rhododendrons of the Sikkim Himalaya, was edited from Hooker's notes, sketches and material by his father, and issued between 1849 and 1851; the second, a volume of illustrations of Himalayan plants, chiefly made on behalf of an Indian friend, Mr. Cathcart, in the neighbourhood of Darjeeling, was edited, with descriptions by Hooker himself, in 1855. During this period, Hooker and Thomson collaborated in the preparation of a 'Flora Indica,' the first and only volume of which appeared in 1855; in the previous year, Hooker had published his 'Himalayan Journals,'

one of the best books of travel ever written, in which the results of his Indian journeys, botanical and non-botanical, are summarised. It is sometimes forgotten that as a traveller Hooker, with his wide range of knowledge and his almost illimitable interests, did not confine himself to botanical observations. It is true that no botanical field-work has been more full of interest or has proved of greater value than that done by Hooker in Sikkim, and it is perhaps natural for those whose studies are confined to botanical problems to look upon this work as the chief harvest garnered by Hooker in the Eastern Himalayas. But it is probable that the trained surveyor would join issue with the botanist and would declare that however valuable Hooker's botanical results may have proved, his topographical results were of even greater importance. If the political consequences be taken into account the surveyor's view must be accepted as the more just. These topographical results, after their reduction, formed the basis of a map published by the Survey of India. This map has proved so accurate and so detailed as to have enabled the Government of India to carry out with success more than one political mission and more than one military campaign. The active publication of Hooker's Indian results ceased for a time with the return to India of Thomson and with the appointment of Hooker in 1855 to the post of Assistant Director at Kew under his father. During the period between his return from the Indian journeys and his appointment to the Kew staff, Hooker and Thomson accomplished the task of arranging and approximately identifying their own extensive collections of Indian plants with a view to the distribution of their duplicates. Before this work had been completed the Indian collections of Falconer, Griffith, and Helfer, made over to Kew from the cellars of the East India House, had to be dealt with in the same manner. The latter task had not been completed when Thomson departed, but another smaller though very important one was successfully accomplished. Besides the three collections mentioned, the residuum of the Indian Herbarium distributed by Wallich on behalf of the Honourable East India Company was also entrusted to Kew. The distribution of this great collection took place between 1828 and 1832 ; there was consequently no set of its plants at Kew. In this Kew did not stand alone, the herbarium attached to the Royal Botanic Garden, Calcutta, at whose cost and for whose benefit the collection had to be brought together, was in like case. By a happy chance the friends were thus enabled to fill more or less satisfactorily a great hiatus in the herbaria of both gardens ; a set, fairly complete, so far at least as the plants collected by Wallich himself are concerned, was made up and laid into the herbarium at Kew, while a similar set was taken to Calcutta by Thomson. The early inclination towards the study of Cryptogams found no opportunity of asserting itself between 1851 and 1855 ; that towards palaeobotanical studies, though not completely inhibited, because several interesting contributions to our knowledge of fossil botany were published by Hooker during the years 1853 to 1855, was less active than it had been before he sailed for India in 1847.

The period during which Hooker was Assistant Director at Kew was one of extraordinary activity. During the ten years that he

held this position he was throughout closely occupied with his sub-antarctic work, the third section of which, under the subordinate title 'Flora Tasmaniae,' was completed in 1860. In some respects the Introductory Essay to this work, on the origination and distribution of species, is the most important of Hooker's many important contributions to scientific literature. In intrinsic value, it is second to none of his writings; it is second to none in its philosophical character. Its chief interest and importance is, however, an extrinsic one, for it fully explains and amply justifies the action taken by Hooker when, in conjunction with Lyell, he prevailed on his friend Darwin to publish, in 1858, a preliminary sketch of his epoch-making hypothesis. This essay had hardly appeared when Hooker was able to make yet another journey and add still further to his knowledge of topographical botany. In the autumn of 1860, he accompanied Captain Washington, Hydrographer of the Royal Navy, on a scientific visit to Syria and Palestine. During this visit an ascent was made of Mt. Lebanon and as a result Hooker published, two years later, an interesting and valuable paper on the cedars of Lebanon, Taurus, Algeria and India. Much of the information gained during this journey was embodied in a masterly sketch of the botany of Syria and Palestine, published in 1863 in Smith's Bible Dictionary. On his return from Syria we find Hooker closely occupied in working out the results to be derived from a study of the plants of the northern circumpolar regions. This subject, cognate to much of his work connected with corresponding southern regions, had first received his attention in 1856, when working out the collections brought together during the Franklin searches; he returned to it in 1861 when dealing with those collected in the M'Clintock expedition. In the following year he dealt with the subject in a comprehensive fashion in his 'Outlines of the distribution of Arctic plants,' a paper that is one of the classics of phytogeography. But while all this was in progress he undertook the contribution to the series of Colonial Floras prepared under Government authority at Kew, of a 'Hand-book of the New Zealand Flora,' in two volumes, the first of which appeared in 1864.

The period while Hooker was Assistant Director was also marked by the publication of three important papers, more restricted as to subject, but of the highest value as contributions to our knowledge of morphological botany. These were a study of the structure and affinities of the *Balanophoreae*, published in 1856; a study of the origin and development of the pitchers of *Nepenthes*, published in 1859, and a study of the genus *Welwitschia*, published in 1863. The second of these studies had also an important physiological bearing.

Another group of phytogeographical problems occupied Hooker's attention during this period. They had indeed been before him almost from the commencement of his active career, and his interest in them dates from his own visits, made on the way to the circumpolar regions, to the Azores, Madeira, the Canaries, Cape Verde Islands, St. Paul's Rock, Ascension, St. Helena and South Trinidad. But the problems were as imminently present in connection with his visits to other islands and in connection with his studies of the vegetation of the Galapagos Group in 1847, and of Raoul in the Kermadec

Group in 1856. It is therefore only proper to assign to this period the formation of the views to which expression was given in a discourse on 'Insular Floras' at the Norwich meeting of the British Association in 1866, the year following its close.

During this period, Hooker continued, in conjunction with Thomson, the floristic work based on their Indian collections. Their 'Flora Indica,' the only volume of which had been issued in 1855, was indeed definitely abandoned. But during the years 1858 to 1861 the two friends published a series of 'Praecursores' dealing with the species of a number of important natural families of Indian plants. Hooker also took a very considerable share between 1858 and 1864 in the preparation of Thwaites' enumeration of the plants of Ceylon, and was responsible for the preparation and issue, in 1865, of the catalogue of the specimens distributed from the herbaria of Falconer, Griffith and Helfer.

If during this period we find no further palaeobotanical contributions, there is evidence that his interest in the flora of Africa, lit up by his visits to the Cape Verde and other islands in 1839, further manifested in 1847 and 1849, and again shown in 1852, 1854, 1860 and 1861 had not abated, because in 1862 and again in 1864 he dealt critically with the important collections made by Mann in Fernando Po and the Cameroons; in 1865 he described some new and interesting African species of *Aristolochia*; in 1868 and 1871 he contributed to the 'Flora of Tropical Africa.' But the most important systematic work undertaken during the time that Hooker was Assistant Director has still to be mentioned. He began in collaboration with Mr. Bentham the preparation of a 'Genera Plantarum,' based principally on the material contained in the herbarium at Kew. The first portion of this, one of the most important botanical works of the nineteenth century, was issued in 1862, and the first volume, ending the *Calyciflorae*, was completed in 1865.

The death in that year of the illustrious Sir W. J. Hooker was followed by the succession of his son to the post of Director of the Royal Gardens, Kew. This post Hooker occupied during the next twenty years. The onerous administrative duties of this position did not, however, interfere with the prosecution of the work he already had in hand. The New Zealand flora for the Colonial Floras series had indeed already been nearly completed, the second and concluding volume was issued in 1867. He continued to take his share in the preparation of the great 'Genera Plantarum,' the second volume of which was issued in 1876, the third and concluding one in 1883. With the succession to the Directorship came also succession to the editorship of the 'Botanical Magazine' and of the 'Icones Plantarum,' both of which he continued to issue after his own retirement in 1885. His father's death added to Hooker's duties also that of replacing, by his own 'Students' Flora' published in 1870, the well-known 'British Flora.' He also annotated and rearranged the natural families of plants in the English edition of Le Maout and Decaisne in 1873, and in 1876 he wrote one of the most difficult to prepare but one of the most effective of his publications, the volume on 'Botany' tor the series of Science Primers.

The exacting character of Hooker's duties as Director did not entirely debar him from further botanical travel, for he was able to

take part with the late Mr. J. Ball and Mr. G. Maw in an expedition to Morocco and the Atlas range in 1871, during which the party made the first ascent by European travellers of the peak of Jebel Tezah. An account of the ascent of the range was published by Hooker in 1871 ; the botanical results were formally dealt with by Ball in 1873. A general account of the expedition under the title 'A tour in Marocco and the Great Atlas,' written by Hooker and Ball in collaboration, was published in 1878. This journey and its journal are not, however, the only indications that Hooker's interest in the botany of the Dark Continent continued unabated, for he dealt with one of the most interesting of the problems connected therewith in a paper on the subalpine vegetation of Kilimanjaro in 1875, and the subject of tropical African mountain floras was again alluded to by Hooker in 1884. But in this case the peculiar interest he took in the subject was of a general rather than a local nature and was closely associated with the interest still taken in the distribution of Arctic plants, which was manifested once more in a paper published in 1874, and with his interest in the vegetation of remote islands in the southern seas, shown in papers on the plants of Tristan d'Acunha published in 1875 and on those of Kerguelen published in 1879. The whole subject of Geographical Distribution was exhaustively summarised by Hooker in his sectional address delivered at the York meeting of the British Association in 1881.

The African journey of 1871 was not, however, the only one that Hooker was able to make while Director of Kew. In 1877, in company with his friend Dr. Asa Gray, and with Dr. Hayden of the United States Survey, he paid a botanical visit to Colorado, Wyoming, Utah, the Rocky Mountains, the Sierra Nevada and California. Hooker's interest in the vegetation of the New World had so far found little opportunity of manifesting itself. That it had existed as long as the interest he took in the flora of Africa we know from the fact that his earliest paper on the subject, dealing with a species from the Andes of Colombia, dates from 1847, while his first note referring to the vegetation of North America dates from 1853. If the only manifestation of this interest during the fruitful period of his Assistant Directorship be a note on a New Brunswick fern published in 1865, we know that it was still active because to that period belongs some of the work expended on the monograph of *Rosaceae* contributed to the 'Flora Brasiliensis' which was published in 1867. The results of Hooker's visit to North America ten years later were summarised by himself in 'Nature' in the same year, formed the subject of an address to the Royal Institution in 1878, and were embodied in a contribution by Gray and himself to the United States Survey Reports in 1882.

The heavy administrative duties which marked the period from 1865 to 1885 must not be overlooked. While Director at Kew, the condition and arrangement of the collection of hardy trees and shrubs were matters of special concern to Hooker, and the Pinetum was entirely his creation. The valley near the Flagstaff, known as the Berberis Dell, was brought into its present condition between 1869 and 1872. The Rockery or Alpine Garden was created in 1882. Numerous avenues, grassed drives and gravel paths were

opened out or planted during his Directorship, especially in the Arboretum. To mention only a few of these, the Thorn avenue was planted in 1868, that of Atlas Cedars was planted in 1871, the Holly walk in 1874, the Sweet Chestnut avenue in 1880. A new system of supplying water was established between 1866 and 1868; the stables were removed to a more suitable site in 1867 and their removal enabled the opening of the present Cumberland Gate. The drawbridge and entrance known as the Isleworth Gate was provided in 1872.

The range of plant-houses known as the T-range was erected in 1868–9; the Jodrell Laboratory was added to the institution in 1876; a new hall, added to the Herbarium building, was completed in 1877; a wing was added to No. I. Museum in 1881, and the North Gallery was completed and opened to the public in 1882.

With all the burden of these duties upon him Hooker was still able to take his full share of the public work that falls to be performed by men of science. In 1866 he undertook to deliver one of the evening discourses at the Nottingham meeting of the British Association; the subject, 'Insular Floras,' has already been alluded to. In 1868 he was President of the meeting of the Association held at Norwich, and his opening address, which dealt with the value and functions of museums, was prefaced by an unqualified advocacy of the acceptance of the hypothesis of his friend Darwin as the surest means of promoting natural knowledge, which produced a marked and lasting effect on scientific thought. In 1874 he was chairman of the department of Zoology and Botany in the Biological section at the meeting of the Association in Belfast, taking as his subject the carnivorous habits of plants and reviewing a group of problems to which his own observations and researches on *Nepenthes*, published in 1859, had drawn especial attention. In 1881 he presided over the Geographical section of the Association at its meeting in York and delivered an address on 'Geographical Distribution' of the greatest importance and value.

In 1873 Hooker was chosen to fill the highest post to which an English man of science can attain—the Presidentship of the Royal Society; he occupied the presidential chair during the next five years. As our record indicates, the exacting duties which this position entails neither interfered with the performance of his administrative work nor curtailed his activity as a botanical author. To this activity we again turn in order to record the commencement of what was to prove in some respects the heaviest and most sustained of the tasks of his life. The distribution of the Indian specimens on which Hooker and Thomson had been engaged was hardly completed when a similar necessity arose through the accession of the Peninsular Indian herbarium of Dr. Wight. The catalogue required for this collection was ready for issue and the preliminary work completed by 1870. The preparation of a 'Flora of British India' on the lines of the Colonial Floras prepared at Kew could at last be begun. The opening part of the first volume was issued in 1872 and the volume completed in 1875. The second volume was completed in 1879, the third in 1882, and the fourth in August, 1885. Three months later Hooker retired from the Directorship of Kew, taking up his residence at the Camp, near

Sunningdale, where he had built a house and laid out a charming and well-furnished garden.

If retirement, in Hooker's case, meant release from the cares of administration, it did not mean leisure. He continued to edit the 'Icones Plantarum' for four more years, until the end of 1889, and the 'Botanical Magazine' for the next 17 years, until 1902, when he associated with himself in this task Mr. W. B. Hemsley, with whose assistance he snpervised the volumes for 1903 and 1904. With the completion of the volume for that year, the one hundred and thirtieth of the series, his connection with the historic serial came to an end. These two enterprises, however, were trifling as compared with the heavy task connected with the Indian Flora, nearly half of which had still to be done. Its preparation went on with the steadiness that had marked the progress of the earlier volumes. The fifth volume, containing four parts—the earlier volumes only including three each, was finished in 1890; the sixth, also a volume of four parts, was completed in 1894; the seventh and concluding volume appeared in 1897. While this volume was being written, Hooker arranged for publication a Century of drawings of orchids, for which he provided the descriptions, selected from among the botanical drawings belonging to the Calcutta herbarium, which had been placed at his disposal while preparing the fifth and sixth volumes of the 'Flora.' This 'Century of Orchids,' a large quarto, was published in 1895.

Meanwhile, however, Hooker had undertaken the superintendence of another heavy task. His friend Darwin, some time before his death, informed Hooker of his intention to devote a considerable sum to meet the cost of some work of utility to biological science, and to arrange that this might be completed if it were not finished during his own lifetime. His difficulties in connection with his own studies led Darwin to suggest that the work should consist of an index to the names, authorities and countries of all flowering plants; Darwin requested Hooker to undertake the supervision and direction of its preparation. This Hooker did, the compilation of the index being entrusted to Mr. B. D. Jackson. The result is the 'Index Kewensis,' a work with regard to which the feeling is one of incapacity to understand what its absence implied. The issue of this Index occupied the period from 1893 to 1895.

The responsibility connected with the 'Index Kewensis' had barely ended ere Hooker arranged, as an act of justice to the memory of Sir Joseph Banks, to edit the 'Journal' kept by that naturalist during Captain Cook's first voyage, 1768–71; this edition was published in 1896. Just as this volume appeared an appeal was made to Hooker to undertake the completion of the 'Handbook to the Flora of Ceylon' begun by Dr. Trimen, but of which only three parts had appeared when Trimen died. Hooker responded to the appeal, and in 1898 the fourth part, edited to some extent from manuscript left by Trimen, was issued from the press; the fifth and concluding part, which Hooker had to write himself, was published in 1900.

The next two years were devoted to the preparation of a life of his father, Sir William Jackson Hooker, the first Director. This life appeared in December 1902, simultaneously with the

arrangement which relieved him of the heavier part of the work connected with the 'Botanical Magazine.' The relief which this arrangement brought was, however, more than compensated for by the inception of yet another task. He undertook, at the request of the Government of India, to prepare for a new edition of the 'Imperial Gazetteer' a sketch of the vegetation of the Indian Empire. This extremely difficult task was successfully accomplished; the sketch was published in 1904, the year in which Hooker's connection with the 'Botanical Magazine' was finally severed.

In seeking for a subject to occupy the leisure which had at last arrived, Hooker selected one that sufficed to occupy the remaining years of his life. Among the natural families of Indian plants with which he and Thomson had dealt in their 'Praecursores,' one of the most interesting and at the same time one of the most difficult had been the *Balsamineae*, their account of which was published in 1859. Wight and Beddome both subsequently gave especial attention to the South Indian members of this group, and in 1874 Hooker himself dealt with them once more in the 'Flora of British India.' But during the 30 years which had elapsed many new Indian and Chinese forms had been collected; the characters of some of these appeared to invalidate earlier conclusions. To the study of these plants, so varied in form and so intricate in their relationships, Hooker devoted his attention almost exclusively from 1904 onwards, with the most satisfactory results. In the course of his studies he received the most willing assistance in the form of the supply of material from those in charge of the leading herbaria in Europe; in return he has placed those herbaria under a lasting obligation by providing them with a uniform system of determinations of the specimens they contain. On this work which, at any rate as regards the Asiatic species, has been practically completed, Hooker was engaged almost to the end of his life.

In this sketch of what Hooker was able to accomplish during the seven decades over which his active working career extended, allusion has been made only to those contributions to material knowledge which are primarily scientific. It has further to be pointed out that even in this limited review no attempt has been made to provide an exhaustive summary of his scientific botanical results. This, it may be remarked, can only be properly done when the task of writing a life of Hooker is undertaken. Nor has even passing allusion been made to what was an ever-present motive in all that Hooker did, the application to practical and commercial ends of the scientific knowledge which we owe to his labours. The decision to exclude such references from our sketch has been two-fold. The object in view has been to provide material for an estimate of the nature of his studies as guided by personal inclination and as affected by external conditions. On the other hand, his purely economic results, unlike his primarily scientific ones, have been very compactly presented. If we except a few economic papers, such as his report on substances used as food, prepared at the time of the Great Exhibition of 1851, with one or two minor papers between 1851 and 1855, and again some minor papers from

1886 onwards, practically the whole of his economic contributions are to be found in the series of 'Kew Reports' published by his father between 1855 and 1865 while Hooker was Assistant Director, and in the same series from 1865 onwards while he was Director at Kew.

Nor has more than passing allusion been made to the fact that in fields of study other than botanical his interest was as keen and his contributions to knowledge were as valuable as those in the science which he primarily served. Regarding his services to geography, it is hardly necessary to say more than has already been said, save to point out that these services were as great and equally effectively rendered on the technical side by his work as a topographical surveyor and cartographer, and on the philosophical side by his contributions to phytogeography. But his services to geology have also been of lasting value, and here again not only on the palaeontological side but in that interesting region wherein geology and physiography join hands. If study on the former side was given up under the pressure of other duties somewhat early in his career, the interest in the subject never abated; that his interest in problems relating to physiography remained unimpaired is indicated by his recurrence to the subject in a short note on the evidences of ancient glaciers in Central France published in 1876. His zoological interests, too, were as keen as his physiographical, and, at all events in the earlier part of his career, were by no means confined to the bearing of zoological evidence on questions of distribution. One of his earliest papers, published in 1845, is a note on marine animals brought up by deep-sea dredging during the Antarctic voyage; his Himalayan Journals, too, are replete with important zoological field-notes. The science of meteorology, too, was included in the wide field over which Hooker's interests extended; another early contribution, published in 1848, deals with the temperature of the soil in Egypt, while the Himalayan Journals are again replete with valuable meteorological information which had already been presented in a compact and illuminating manner in a paper on the climate and vegetation of East Nepal and Sikkim published in 1852.

If the record of Hooker's contributions to scientific botanical literature be examined more closely we find that in the environment created by the presence of his father's collections in Glasgow, Hooker developed a strong inclination for work connected with Cryptogamic plants. This inclination was manifested in his two earliest papers, written before he departed on his Antarctic voyages. It reached its maximum during the period 1844 to 1847, between his return from the Antarctic and his departure for India, his range of study including hepatics, mosses, lichens, seaweeds and diatoms. But the wider problems relating to the distribution and even to the nature of species, as to which the evidence of cryptogamic plants, with their more extended range, is not so effective as that afforded by phanerogams, led to his giving greater attention to the latter, and Hooker practically abandoned sustained cryptogamic study when he left for the East.

We find, however, that at almost as early a period Hooker developed a strong inclination for palaeobotanical study. This

inclination is shown in an early paper written and published while he was botanist on the "Erebus." The inclination, as was natural, was at its maximum while he was attached to the Geological Survey. It was still manifest, though less markedly so, after his return from India. His last addition to this field of knowledge appeared in 1855; after he became Assistant Director, Hooker did not again actively engage in palaeobotanical study.

If from this period onwards Hooker's work had as its material mainly phanerogamic plants, that work was of the most varied character. It is not difficult to trace the existence, at different periods of his career, of certain dominant interests. Unlike not a few distinguished travellers Hooker did not amass material and then leave it unelaborated. He is, on the contrary, one of the few exceptional men who have been in a position to say that they had ploughed their furrow to the end. Vast as were the collections he had accumulated, before his life ended he had dealt with them all. The circumstances under which his collections had been made of necessity compelled him to deal with them on a floristic basis. The earliest of his collections being those made during his southern voyage, the southern collections were attacked first. The work began immediately on his return to England, and as we have seen, its three geographical sections were dealt with in detail, beginning with the Antarctic and sub-Antarctic section. But we find, from papers pnblished in 1844, that both the New Zealand and Tasmanian sections were already occupying his attention. During the years 1845 to 1847, while the dominant interest was in Antarctic plants he paid no little attention to the Tasmanian flora, this interest culminating in the Tasmanian 'Spicilegium' of 1847, the appearance of which was coincident with the completion of the 'Flora Antarctica' and with his own departure for India. From 1844 till his resumption of work in 1851, the New Zealand interest was in abeyance. The Antarctic work, however, lighted up a new interest which extended its scope, and led to the simultaneous examination of the evidence afforded by isolated islands or island groups in regions other than the sub-Antarctic. This cognate interest, which persisted long after the Antarctic work proper was completed, is shown in papers published in 1846 and 1847, again in 1856, 1857 and 1861, and yet again in 1875 and 1879.

When active work on the collections made in the Southern Seas was resumed after the completion of his Indian journeys, it was to the New Zealand section, hitherto left practically untouched and not to the Tasmanian ones which had occupied him before his departure, that his attention particularly turned. This fresh New Zealand interest was the dominant one until 1855, when Hooker became Assistant Director. But immediately the New Zealand work was over Hooker reverted to the Tasmanian collections, which provided what was his dominant interest until 1859. However, even during this period, the New Zealand interest still asserted itself; he published papers dealing with New Zealand plants in 1857, 1859 and 1860, and the interest again became a dominant one from 1862 till 1867, during which period he prepared the New Zealand 'Handbook.' Meanwhile a new interest, complementary to, and in a manner arising out of the sub-Antarctic work, manifested itself. This was his

interest in Arctic vegetation, a subject he was to make peculiarly his own, which is shown in floristic contributions published in 1856, 1861 and 1873.

But collateral with the strong interests arising out of his own experiences in the field we find that another marked inclination ran through his work up to 1865, when he became Director of Kew. This was his interest in the vegetation of Tropical Africa, evidenced by important floristic contributions to knowledge in 1847, 1849 and 1852, and again in 1860, 1862, 1864 and 1865. This interest was further manifested in the systematic treatment of certain genera and families in 1868 for the first volume and in 1871 for the second volume of the 'Flora of Tropical Africa,' and showed itself again in 1874, but this time in a modified form, in connection with his studies of mountain floras, a subject cognate on the one hand with his Antarctic and Arctic work, on the other hand with his investigations of Insular Floras.

We find from his papers, that as early as 1847 Hooker was ready to deal with American plants as well, but if we except his substantial floristic contributions to the 'Flora Brasilensis,' published in 1867, there is no evidence that a floristic interest in American plants was ever strong. His first definite treatment of a North American plant only dates from 1874, and its mention at all is in connection with its distribution, not with its characters. The very great interest which he did subsequently take in the North American vegetation as the result of his visit to the United States in 1877 was, as we shall see, phytogeographical and not floristic.

From the time of his Indian journeys Hooker's interest in the Indian Flora was as intense as that which he took in the floras dealt with in his 'Botany of the Antarctic voyage' and, thanks to the assistance of his father, a very substantial floristic contribution, based on his material and his field-descriptions was made as early as 1849. Thanks largely too, to the fact that he had the collaboration of his friend and fellow-traveller Thomson, much was accomplished even while the burdens of the Tasmanian and New Zealand floras lay heavily on him and hardly a year passed between 1854 and 1864 without some substantial contribution, either from his own pen or with the collaboration of Thomson, to the floristic study of the vegetation of India, Malaya and Ceylon. But while he was, as we have seen, able to get through the heavy task of the preliminary arrangement of his Indian material in the meantime, the publication of Indian floristic work was in abeyance between 1864 and 1872. As a matter of fact when the New Zealand interest ceased to be dominant in 1867 Hooker's floristic interest was transferred to the British Isles, and this British interest remained the dominant one until in 1870 the 'Students' Flora' appeared. But, this task ended, and the preliminary sorting of the Indian material accomplished, the dominant interest was that which centred in the flora of India. This interest may be said to have remained the dominant one for the rest of Hooker's life. Not only did it continue to be so without a break from 1872 when the first part of the Flora of British India was published till 1897 when that work was completed; it was prolonged till 1900 in connection with the Ceylon Handbook and was revived by the

necessity for the sketch of the vegetation of India issued in 1904. Moreover, the work on the *Balsamineae*, which occupied his life from 1904 till 1911, although it gradually became extended to the whole of eastern and south eastern Asia, had its origin in a monographic study of the Indian species of *Impatiens*.

If, however, so much of Hooker's work has, as the result of his own indefatigable field-work, been of necessity thrown into a floristic mould, this floristic study has been so thorough that all his writings are mines of wealth alike to the systematist, to the morphologist and to the student of botanical philosophy. Nor has he been prevented by the heavy floristic duties which the circumstances of his career imposed upon him from entering with success these various fields of study. So far as his contributions to pure system are concerned it is only necessary to mention his share in the production of the 'Genera Plantarum' between 1860 and 1883. His contributions to pure morphology include his classic papers on *Balanophoreae* in 1856, the ovary of *Siphonodon* in 1857, *Nepenthes* in 1859, and *Welwitschia* in 1863. The *Nepenthes* paper is also important on the physiological side, and its bearing in this direction was more fully developed by Hooker in an address on the habits of carnivorous plants in 1874.

But it is to his contributions to the field of botanical philosophy that Hooker largely owes his place in the roll of fame. His floristic work, though done by the hand of a master, is after all work that, if not done so well, might still have been done by others. But the philosophical papers which commence with his share in the Introductory Essay to the 'Flora Indica' in 1855 and end with his sketch of the vegetation of India in 1904, are those in which stand revealed the teacher we have lost. The first Indian Essay was followed in 1860 by that on the origination and distribution of species prefixed to the 'Flora Tasmaniae,' in 1861 by that on the distribution of Arctic plants, in 1862 by his masterly account of the Cedars, in 1863 by his sketch of the vegetation of Syria and Palestine, in 1866 by his discourse on Insular Floras, in 1867 by his remarks on the struggle for existence as plants, in 1868 by that portion of his address at Norwich which deals with the Darwinian hypothesis, in 1877 and 1878 on the features of the North American flora, in 1881 by his address on Geographical distribution, and in 1882 by his paper on Tropical African Mountain Floras. It is singularly appropriate that this series of masterpieces should end in 1904 as they begin in 1855 with an essay on the vegetation of India, his work connected with which had occupied his almost unbroken attention for a quarter of a century. A feature of these philosophical contributions which arrests the attention of the reader and compels admiration, is the style in which they are written. To this gift of style is due the fact that the 'Himalayan Journal' in which it is equally displayed has, without reference to its scientific contents, been described as one of the best books of travel ever written and has also been characterised as the best guide book ever published. As a man of letters Hooker may be regarded as deserving a position only second to that which he attained as a man of science.

In an appreciation contributed to 'Nature' by his devoted friend Dr. Asa Gray, in 1877, an estimate is given of the quality of

Hooker's work. The fact that of Hooker's most intimate friends and contemporaries Gray was the one who, by stress of circumstance had been, in spite of his versatile talents and varied interests, compelled in the same manner to devote most of his attention to floristic work renders this appreciation doubly valuable. Such as it is, we can only say that what was put on record then applies equally to what has happened since. In this article, written when Hooker was in his sixtieth year, Gray expressed the hope that he might be writing of one who was only in mid-career, a hope that has almost been fulfilled. Nor of Hooker's activity as an administrator need more be said than what Gray has said; it was exercised "in such wise as to win, along with national applause, the gratitude of the scientific world."

Hooker was elected a Fellow of the Linnean Society in 1842, of the Geological Society in 1846, and of the Royal Society in 1847. He served on the Council of the Linnean Society for 24 years, during 15 of these as a Vice-President. On the Geological Society Council he served six years. He also served on the Council of the Royal Society for 17 years, during six of these as a Vice-President and during five as President. He was a correspondent of the Institute of France and an honorary or corresponding member of most of the academies, societies and associations founded for the promotion or application of natural knowledge. Many of these societies bestowed on Hooker still further distinctions. The Royal Society submitted his name for the award of a Royal medal in 1854, and awarded him the Copley medal—the highest honour the Society can bestow—in 1887 and the Darwin medal in 1892. The Linnean Society awarded him the Linnean medal in 1888, and presented to him, in 1897, a medal struck to commemorate his own eightieth birthday and, in 1908, one of the medals struck to commemorate the fiftieth anniversary of the publication of the joint communication by Darwin and Wallace on natural selection, Darwin's share in which was so largely the result of Hooker's action. The Society of Arts awarded him their Albert medal in 1883, the Geographical Society their Founder's medal in 1884, and the Manchester Philosophical Society a medal in 1898. Finally, in 1907, the Royal Swedish Academy, under circumstances already described in this work (*K.B.* 1907, p. 259), conferred upon him what he has himself termed the crowning honour of his long life—the unique medal struck to commemorate the two-hundredth anniversary of the birth of Linnaeus. The University of Oxford conferred on him the honorary degree of D.C.L.; he received the honorary degree of LL.D. from the Universities of Cambridge, Edinburgh, Dublin and Glasgow. In 1869, after he was President of the British Association at Norwich, he was made a C.B.,; in 1877, when about to vacate the Presidentship of the Royal Society, he was created a K.C.S.I.; in 1897, when the 'Flora of British India' was completed, he was made a G.C.S.I.; in 1907, on his ninetieth birthday, he received the Order of Merit. His foreign distinctions included membership of the Royal Swedish Order of the Polar Star—to which in his day Linnaeus had belonged—and of the Royal Prussian Order "Pour le Mérite."

Even in his old age Hooker felt it his duty to respond to invitations to take part in public ceremonies designed to

commemorate occasions of signal importance. Only the distance to be traversed, combined with the weight of his 90 years, prevented him from being present at Upsala in 1907 to do honour to the memory of Linnaeus. In 1908 he not only attended the celebration by the Linnean Society of the fiftieth anniversary of its publication of the joint contribution by Darwin and Wallace, but addressed the delegates and Fellows present in a speech which recounted the part he had been able to take 50 years before. Again, in 1909 he attended—and was the central figure of the occasion—the celebration by the University of Cambridge of the centenary of the birth of Darwin.

At work until within a short time before his death, and keenly interested in current topics and in the latest contributions to natural knowledge till the last, Sir Joseph, whose physical strength had been gradually diminishing since August, died peacefully and painlessly in his sleep. The invitation to receive his ashes in Westminster Abbey was befittingly made. But Sir Joseph had expressed his wish to be buried in the family vault at Kew. There he was laid to rest on Friday, December 15. The funeral took place from the house so long occupied by his father and himself.

Among the mourners were the following members of Sir Joseph's family, representatives of societies and institutions, and others :—

Lady Hooker, Miss Hooker, Mr. W. H. Hooker, Mr. C. P., Mrs., and Mr. E. Hooker, Mr. R. H. Hooker, Mr. R. S. Hooker, Sir W. T. Thiselton-Dyer, Miss Thiselton-Dyer, Mr. G. H. Thiselton-Dyer, Mrs. Whitfield, Mrs. Calverley Bewicke, Mr. R. Woodward, Mr. R. Woodward, junr., Rev. Canon Barker, Mr. G. Barker, Mr. L. Barnard, Mrs. Crowder, Mr. M. Malleson, Mr. J. Murray, Miss G. Palgrave, Mrs. Paul Waterhouse, Capt. A. L. Henslow, Miss Symonds, Mr. R. Symonds, Miss M. Smith, Sir Arthur and Lady Rücker, Mr. T. Maskelyne, Mr. T. A. Rising, Dr. Trail, Rev. A. G. Musgrave, Mr. M. Pitkin; the servants from The Camp, Sunningdale; Royal Society: Sir A. Geikie (President), Sir J. Larmor and Sir J. R. Bradford (Secretaries), Lt.-Col. A. W. Alcock (Council), and Prof. Bayley Balfour, Regius Keeper of the Royal Botanic Gardens, Edinburgh; Society of Antiquaries: Dr. C. H. Read (President); Linnean Society: Dr. D. H. Scott (President), Dr. B. D. Jackson and Dr. O. Stapf (Secretaries); Geological Society: Prof. W. W. Watts (President) and Prof. J. W. Judd (Past-President); Royal Geographical Society: Mr. W. E. Darwin and Lt.-Col. H. H. Godwin-Austen; British Science Guild: Sir Norman and Lady Lockyer; Entomological Society: Prof. R. Meldola; British Medical Association: Mr. G. A. Peake; Royal Horticultural Society: Sir D. Morris; Pharmaceutical Society: Mr. E. H. Holmes; University of Glasgow: Prof. F. O. Bower; Natural History Museum: Mr. E. G. Baker; West Indies: Mr. W. Fawcett; Royal Botanic Gardens, Kew: The Director and Assistant Director, with all the members of the permanent staff, and with detachments representing the constabulary and the labour departments; Miss Baker, Mr. A. E. Bernays, Mrs. Bliss, Prof. G. S. Boulger, Mr. J. Britten, Mr. C. H. Curtis, Prof. Sir G. H. Darwin, Hon. Mrs. H. Darwin, Dr. F.

Darwin, Mr. G. C. Druce, Mr. J. R. Drummond, Miss A. Eastwood, Mr. J. S. and Mrs. Gamble, Mr. W. Goldring, Mr. G. Gordon, Dr. A. C. L. Günther, Mr. R. W. T. Günther, Mr. F. Günther, Mr. W. B. Hemsley, Mr. A. Henry, Mrs. Judd, Mrs. de Courcy Laffan (representing Lady Flower), Surgeon-Gen. Lock and Mrs. Lock, Mr. A. H. Lyell, Capt. F. H. Lyell, Rev. J. B. and Mrs. McClellan, Miss Mead, Prof. D. Oliver and Mrs. Oliver, Prof. F. W. Oliver, Mr. R. Hooper Pearson, Mrs. Prain, Mrs. D. H. Scott, Mrs. W. Sharpe, Mr. Miles Stapylton, Lieut.-Col. Strachey, Mrs. and Miss Thurston, Mr. F. A. Turner, Mr. H. J. Veitch, Prof. S. H. Vines, Dr. F. N. Williams, Dr. R. W. Wilson, Miss Wrigley, Miss Younghusband, Mrs. Borlase, Mrs. and Miss Fitch, Miss Garden, Mrs. Goldney, Mr. L. Huxley, Miss B. Kent, Miss Peel, Miss M. Smith, Miss F. Smith, Mr. and Mrs. Soltau, Mrs. Tyndall. Among those who expressed their regret at being prevented by circumstances from being present were Mr. W. and Mrs. Gardiner, Mr. M. Horner, Sir E. Ray Lankester and Prof. J. W. H. Trail.

List of Works by the late Sir Joseph Hooker.

1837.

Polytrichum semilamellatum, *Grimmia laxifolia*, *Glyphocarpa Roylei*, nn. spp. (Hook. Ic. Pl. 1837, vol. ii. t. 194.)

1840.

Musci Indici; or list of Mosses collected in the East Indies by Dr. Wallich (by W. H. Harvey); to which are added those collected by Dr. Royle in the northern part of India (by J. D. H.). (Hook. Journ. Bot. 1840, vol. ii. pp. 1–21.)

Contributions towards a Flora of Van Diemen's Land, chiefly from the collections of Ronald Gunn, Esq., and the late Mr. Lawrence. (Hook. Journ. Bot. 1840, vol. ii. pp. 399–421.)

Entosthodon obtusifolius, *E. Mathewsii*, *E. latifolius*, nn. spp. (Hook. Ic. Pl. 1840, vol. iii. t. 245); *Tridontium tasmannicum*, n. sp. (t. 248); *Stachhousia flava*, n. sp. (t. 269); *Boronia nana*, n. sp. (t. 270); *Stenopetalum incisifolium*, n. sp. (t. 276); *Baeckia thymifolia*, *B. prostrata*, *B. affinis*, nn. spp. (t. 284); *Myriophyllum variaefolium*, n. sp. (t. 289); *Goniocarpus serpyllifolius*, n. sp. (t. 290); *Claytonia australasica*, n. sp. (t. 293); *Calandrinia calyptrata*, n. sp. (t. 296); *Epilobium macranthum*, n. sp. (t. 297); *Baeckia leptocaulis*, n. sp. (t. 298); *Milligania cordifolia*, n. sp. (t. 299); *Caldasia argentea*, n. sp. (t. 300).

1841.

Xanthosia dissecta, n. sp. (Hook. Ic. Pl. 1841, vol. iv. t. 302); *Hydrocotyle cordifolia*, n. sp. (t. 303); *Didiscus humilis*, n. sp. (t. 304); *Meionectes Brownii*, n. sp. (t. 306); *Didiscus pilosus* (t. 307); *Leptospermum rupestre*, n. sp. (t. 308); *Baeckia micrantha* (t. 309); *Tillaea macrantha*, n. sp. (t. 310); *Goniocarpus vernicosus*, n. sp. (t. 311); *Hydrocotyle tripartita* (t. 312).

1842.

On the examination of some fossil wood from Macquarie Plains, Tasmania. (Tasmanian Journ. Nat. Sci. 1842, vol. i. p. 24.)

1843.

Notes on the Botany of H.M. discovery ships "Erebus" and "Terror," in the Antarctic Voyage; with some account of the Tussac Grass of the Falkland Islands. (By W. J. Hooker, from letters of J. D. H.) (Hook. Lond. Journ. Bot. 1843, vol. ii. pp. 247–329.) Reprint. London, 1843.

1844.

The Botany of the Antarctic Voyage of H.M. discovery ships "Erebus" and "Terror" in the years 1839–1843, under the command of Captain Sir James Clark Ross—

Part I. Flora antarctica. London, 1844–1847. 2 vols., xii. + 574 pp., 198 pl. 4to.

(Pp. 289–302 translated in Ann. Sci. Nat. ser. 3, Bot. 1846, vol. v. pp. 193–225, pl. 5–9.)

Part II. Flora Novae-Zelandiae. Vol. i., Flowering Plants. London, 1853–1855. xxxix. + 312 pp., pl. 1–70.—Vol. ii., Flowerless Plants. 1855. 378 pp., pl. 71–130. 4to.

Introductory Essay, pp. i.–xxxix. reprinted, London, 1853. (Analysis of the Introductory Essay, pp. ii.–xxxvi. by A. Gray in Amer. Journ. Sci. Arts, 1854, ser. 2, vol. xvii. pp. 241–252, 334–350.)

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Some account of a new *Elaeodendron* from New Zealand. (Hook. Lond. Journ. Bot. 1844, vol. iii. pp. 228–230, pl. 8.)

Catalogue of the names of a Collection of Plants made by Mr. Wm. Stephenson, in New Zealand. (Hook. Lond. Journ. Bot. 1844, vol. iii. pp. 411–418.)

Hepaticae Antarcticae; being characters and brief descriptions of the Hepaticae discovered in the southern circumpolar regions during the voyage of H.M. discovery ships "Erebus" and "Terror." (By J. D. H. and T. Taylor.) (Hook. Lond. Journ. Bot. 1844, vol. iii. pp. 454–480.)

Notes on the Cider Tree (*Eucalyptus Gunnii*). (Hook. Lond. Journ. Bot. 1844, vol. iii. pp. 496–501.)

Musci Antarctici; being characters, with brief descriptions, of the new species of Mosses discovered during the voyage of H.M. discovery ships "Erebus" and "Terror" in the southern circumpolar regions, together with those of Tasmania and New Zealand. (By J. D. H. and W. Wilson.) (Hook. Lond. Journ Bot. 1844, vol. iii. pp. 533–556.)

Hepaticae Novae Zelandiae et Tasmaniae ; being characters and brief descriptions of the Hepaticae discovered in the Islands of New Zealand and Van Diemen's Land, during the voyage of H.M. discovery ships "Erebus" and "Terror," together with those collected by R. C. Gunn and W. Colenso. (By J. D. H. and T. Taylor.) (Hook. Lond. Journ. Bot. 1844, vol. iii. pp. 556–582.)

Lichenes Antarctici ; being characters and brief descriptions of the new Lichens discovered in the southern circumpolar regions, Van Diemen's Land, and New Zealand, during the voyage of H.M. discovery ships "Erebus" and "Terror." (By J. D. H. and T. Taylor.) (Hook. Lond. Journ. Bot. 1844, vol. iii. pp. 634–658.)

Lomaria Colensoi, n. sp. (Hook. Ic. Pl. 1844, vol. vii. t. 628); *Myrtus pedunculata*, n. sp. (t. 629); *Fagus fusca*, n. sp. (tt. 630, 631); *Callixene parviflora*, n. sp. (t. 632); *Loranthus Colensoi*, n. sp. (t. 633); *Ranunculus macropus*, n. sp. (t. 634); *Gentiana bellidifolia*, n. sp. (t. 635); *G. Grisebachii*, n. sp. (t. 636); *Fagus Solandri*, n. sp. (t. 639): *Veronica nivea*, n. sp. (t. 640); *V. diffusa*, n. sp. (t. 645); *Fagus Menziesii*, n. sp. (t. 652); *F. cliffortioides*, n. sp. (t. 673); *Stellaria decipiens*, n. sp. (t. 680); *Epilobium confertifolium* (t. 685); *Cardamine corymbosa* (t. 686.)

1845.

Hepaticae Antarcticae, supplementum ; or specific characters, with brief descriptions, of some additional species of the Hepaticae of the Antarctic regions, New Zealand, and Tasmania, together with a few from the Atlantic Islands and New Holland. (By J. D. H. and T. Taylor.) (Hook. Lond. Journ. Bot. 1845, vol. iv. pp. 79–97.)

On the Huon Pine, and on *Microcachrys*, a new genus of *Coniferae* from Tasmania ; together with remarks upon the geographical distribution of that order in the Southern Hemisphere. (Hook. Lond. Journ. Bot. 1845, vol. iv. pp. 137–157, pl. 6.)

Algae Antarcticae, being characters and descriptions of the hitherto unpublished species of Algae, discovered in Lord Auckland's Group, Campbell's Island, Kerguelen's Land, Falkland Islands, Cape Horn, and other circumpolar regions, during the voyage of H.M. discovery ships, "Erebus" and "Terror." (By J. D. H. and W. H. Harvey.) (Hook. Lond. Journ. Bot. 1845, vol. iv. pp. 249–276, 293–298.)

Algae Novae Zelandiae ; being a catalogue of all the species of Algae yet recorded as inhabiting the shores of New Zealand, with characters and brief descriptions of the new species discovered during the voyage of H.M. discovery ships "Erebus" and "Terror" ; and of others communicated to Sir W. Hooker by Dr. Sinclair, the Rev. W. Colenso, and M. Raoul. (By J. D. H. and W. H. Harvey.) (Hook. Lond. Journ. Bot. 1845, vol. iv. pp. 521–551 ; vol. vii. pp. 443–445.)

On *Fitchia*, a new genus of arborescent *Compositae* (Trib. *Cichoraceae*), from Elizabeth Island (lat. 26°, long. 125° W.), in the South Pacific. (Hook. Lond. Journ. Bot. 1845, vol. iv. pp. 640–643, pl. 23, 24.)

Note on some marine animals, brought up by deep-sea dredging, during the Antarctic Voyage of Captain Sir James C. Ross. (Ann. Nat. Hist. 1845, vol. xvi. pp. 238–239.)
Aralia polaris. (Hook. Ic. Pl. 1845, vol. viii. t. 747.)

1846.

Note on a fossil plant from the Fish River, South Africa. (Trans. Geol. Soc. 1846, vol. vii. p. 227.)
Description of *Pleuropetalum*, a new genus of *Portulaceae*, from the Galapagos Islands. (Hook. Lond. Journ. Bot. 1846, vol. v. pp. 108–109, pl. 2.)
Description of a new genus of *Compositae* [*Scleroleima*], and a new species of *Plantago* [*P. Gunnii*], from the mountains of Tasmania. (Hook. Lond. Journ. Bot. 1846, vol. v. pp. 444–447, pl. 13, 14.)

1847.

J. C. Ross, A voyage of discovery and research in the Southern and Antarctic Regions, during the years 1839–43, vol. i. pp. 83–87, 144–149, 158–163 ; vol. ii. pp. 5–8, 261–277, 288–302. London, 1847.
Florae Tasmaniae Spicilegium ; or Contributions towards a Flora of Van Diemen's Land. (Hook. Lond. Journ. Bot. 1847, vol. vi. pp. 106–125, 265–286, 461 [bis]–479 [bis].)
Botany of the Niger Expedition ; notes on Madeira plants. (By W. J. Hooker and J. D. H.). (Hook. Lond. Journ. Bot. 1847, vol. vi. pp. 125–139.)
Description of a new species of *Lysipoma*, from the Andes of Columbia. (Hook. Lond. Journ. Bot. 1847, vol. vi. pp. 286–287, pl. 9a.)
Algae Tasmanicae ; being a catalogue of the species of Algae collected on the shores of Tasmania, with characters of the new species. (By J. D. H. and W. H. Harvey.) (Hook. Lond. Journ. Bot. 1847, vol. vi. pp. 397–417.)

1848.

On the diatomaceous vegetation of the Antarctic Ocean. (Brit. Assoc. Rep. 1847 [1848], pt. 2, pp. 83–85.)
On the vegetation of the Carboniferous period, as compared with that of the present day (Mem. Geol. Survey, 1848, vol. ii. pp. 387–430 ; Edinburgh New Phil. Journ. 1848, vol. xlv. pp. 362–369 ; vol. xlvi. pp. 73–78 ; pp. 398–400 reprinted in Amer. Journ. Sci. Arts, 1849, vol. viii. pp. 131–133.)
On some peculiarities in the structure of *Stigmaria*. (Mem. Geol. Survey, 1848, vol. ii. pp. 431–439.)
Remarks on the structure and affinities of some *Lepidostrobi*. (Mem. Geol. Survey, 1848, vol. ii. pp. 440–456.)
Observations made when following the Grand Trunk Road across the hills of Upper Bengal, Páras-Náth, &c. in the Soane Valley ; and on the Kymaor branch of the Vindhya hills. (Journ. As. Soc. Bengal, 1848, vol. xvii. pt. 2, pp. 355–411 ; translated in Berghaus, Zeitschr. für Erdk. 1849, vol. ix. pp. 230–242.) Reprint. Calcutta, 1849.

Botanical mission to India. (Hook. Lond. Journ. Bot. 1848, vol. vii. pp. 237–268, 297–321 ; Hook. Kew Journ. Bot. 1849, vol. i. pp. 1–14, 41–56, 81–89, 113–120, 129–136, 161–175, 226–233, 274–282, 301–308, 331–336, 337–344, 361–370; 1850, vol. ii. pp. 11–23, 52–59, 88–91, 112–118, 145–151, 161–173, 213–218, 244–249.)

Letters to A. von Humboldt, 1848–1849. (Translated in Berghaus, Zeitschr. für Erdk. vol. ix. p. 230 ; Berghaus, Geogr. Jahrb. vol. i.)

1849.

The Rhododendrons of Sikkim-Himalaya. (Edited by W. J. Hooker.) London, 1849–1851. 14 + 7 pp., 30 pl. with descriptive text. fol.

Notes, chiefly botanical, made during an excursion from Darjiling to Tonglo. (Journ. As. Soc. Bengal, 1849, vol. xviii. pt. 1, pp. 419–446 ; Journ. Hort. Soc. 1852, vol. vii. pp. 1–23.) Reprint. Calcutta, 1849.

Flora nigritiana. (By J. D. H. and G. Bentham.) (W. J. Hooker, Niger Flora, pp. 199–577, pl. 17–50. London, 1849. 8vo.)

Enumeration of the Plants of the Galapagos Islands, with descriptions of the new species. (Proc. Linn. Soc. 1849, vol. i. pp. 276–279 ; Trans. Linn. Soc. 1851, vol. xx. pp. 163–234.)

Extract from a letter to Professor Wheatstone [on the temperature of the soil in Egypt, &c.]. (Brit. Assoc. Rep. 1848 [1849], pt. 2; pp. 17–19.)

1850.

Letter from Churra Poonji, Khasiah Hills. (Gard. Chron. 1850, pp. 694, 710.)

Webb and Berthelot, Histoire Naturelle des Iles Canaries, vol. iii. pt. 3, 1836–1850, pp. 430–432.—*Balanophoreae.*

1851.

A fourth excursion to the passes into Tibet by the Donkiah Lah. (Journ. Geogr. Soc. 1851, vol. xx. pp. 49–52, with map.)

On the physical character of Sikkim-Himalaya ; a letter to A. von Humboldt, 1850. (Hook. Kew Journ. Bot. 1851, vol. iii. pp. 21–31.) Reprint, with sketch-map.

On the vegetation of the Galapagos Archipelago, as compared with that of some other tropical islands and of the continent of America. (Proc. Linn. Soc. 1849, vol. i. pp. 313–314 ; Trans. Linn. Soc. 1851, vol. xx. pp. 235–262.)

Report on substances as used as Food. (Report of Juries, Class III., Great Exhibition, London, 1851, pp. 123–162.)

1852.

Description of a new species of *Amomum*, from tropical West Africa. (Hook. Kew Journ. Bot. 1852, vol. iv. pp. 129–130, pl. 5 ; Pharm. Journ. vol. xii. pp. 192–194.)

On the climate and vegetation of the temperate and cold regions of East Nepal and the Sikkim-Himalaya Mountains. (Journ.

Hort. Soc. 1852, vol. vii. pp. 69–131 ; Journ. Agric. Soc. India, 1854, vol. viii. pp. 35–65, 73–95.) Reprint. London, 1852.

Report of enquiry into the best mode of detecting vegetable substances mixed with Coffee for the purposes of Adulteration, &c. (By J. Lindley and J. D. H.) London, 1852. 8 + 13 pp., 3 + 4 col. pl. fol. Lithographed.

Luminous plants. (Gard. Chron. 1852, p. 86.)

Fagus Gunnii, n. sp. (Hook. Ic. Pl. 1852, vol. ix. t. 881) ; *Cardamine radicata*, n. sp. (t. 882) ; *Rhododendron Lowii*, n. sp. (t. 883) ; *R. verticillatum* (t. 884) ; *R. rugosum*, n. sp. (t. 885) ; *R. acuminatum*, n. sp. (t. 886) ; *R. ericoides*, n. sp. (t. 887) ; *Nepenthes villosa*, n. sp. (t. 888) ; *Phyllocladus hypophylla*, n. sp. (t. 889) ; *Rhododendron buxifolium*, n. sp. (t. 890) ; *Vaccinium buxifolium*, n. sp. (t. 891) ; *V. coriaceum*, n. sp. (t. 892) ; *Leptospermum recurvum*, n. sp. (t. 893) ; *Diplycosia ciliolata*, n. sp. (t. 894) ; *Drapetes ericoides*, n. sp. (t. 895) ; *Drimys piperita*, n. sp. (t. 896) ; *Agalmyla tuberculata*, n. sp. (t. 897) ; *Leucopogon lancifolius*, n. sp. (t. 898).

1853.

On the distribution and organic contents of the "Ludlow Bone Bed," in the districts of Woolhope and May Hill. With a note on the seed-like bodies found in it. (By J. D. H. and H. E. Strickland.) (Journ. Geol. Soc. 1853, vol. ix. pp. 8–12.)

On a new genus [*Milligania*] and some new species of Tasmanian plants. (Hook. Kew Journ. Bot. 1853, vol. v. pp. 296–300, pl. 7–9.)

Note on the occurrence of an eatable *Nostoc* in the Arctic Regions and in the mountains of Central Asia. (Phytologist, 1853, vol. iv. pp. 856–859 ; Proc. Linn. Soc. 1855, vol. ii. pp. 166–169.)

Lindley, The Vegetable Kingdom, ed. 3, 1853, pp. 88–90, 94.—*Balanophoraceae*, *Mystropetalinae*.

Botanical Expedition to Oregon ; a review. (Hook. Kew Journ. Bot., 1853, vol. v. pp. 315–317.)

1854.

Himalayan Journals ; or notes of a naturalist in Bengal, the Sikkim and Nepal Himalayas, the Khasia mountains, &c. London, 1854. Vol. i. xviii. + 408 pp., 5 col. pl., 2 maps. Vol. ii. xii. + 487 pp., 7 col. pl.—Ed. 2. London, 1855. Vol. i. xviii. + 348 pp. Vol. ii. xii. + 345 pp. — Another ed. Minerva Library, London, 1891, 1 vol., xxxii. + 574 pp., 13 pl., 2 maps.—Re-issue. London, 1905. 606 pp. 8vo.

Notes on the fossil plants from Reading. (Journ. Geol. Soc. 1854, vol. x. pp. 163–166.)

On a new species of *Volkmannia* (*V. Morrisii*). (Journ. Geol. Soc. 1854, vol. x. pp. 199–202.)

On the structure and affinities of *Trigonocarpon* (a fossil fruit of the coal-measures). (Proc. Roy. Soc. 1854–55, vol. vii. pp. 28–31 ; Ann. Nat. Hist. 1854, vol. xiv. pp. 209–212.)

On the functions and structure of the rostellum of *Listera ovata*. (Phil. Trans. 1854, pp. 259–264 ; translated in Ann. Sci. Nat. 1855, ser. 4, Bot., vol. iii. pp. 85–90.)

On some species of *Amomum*, collected in Western Tropical Africa by Dr. Daniell, Staff Surgeon. (Hook. Kew Journ. Bot. 1854, vol. vi. pp. 289–297.) Reprint. London, 1854.

On *Maddenia* and *Diplarche*, new genera of Himalayan plants. (By J. D. H. and T. Thomson.) (Hook. Kew Journ. Bot. 1854, vol. vi. pp. 380–384, pl. 11–12.) Reprint. London, 1854.

Rhododendron anthopogon. (Gard. Chron. 1854, p. 182.)

On the possibility of impregnating ovules after the removal of the stigma. (Gard. Chron. 1854, p. 629.)

Lomaria nigra (Hook. Ic. Pl. 1854, vol. x. t. 960); *Lycopodium scariosum*, var. *decurrens* (t. 966) ; *Lomaria vulcanica* (t. 969) ; *Asplenium adiantoides*, var. *Richardi* (t. 977); *A. adiantoides*, var. *minus* (t. 983); *A. adiantoides*, var. *Colensoi* (t. 984); *Cyathea Cunninghami*, n. sp. (t. 985).

1855.

Flora indica: being a systematic account of the plants of British India, together with observations on the structure and affinities of their natural orders and genera. (By J. D. H. and T. Thomson.) Vol. i. [all published] xvi. + 280 + 285 pp., 2 maps. London, 1855. 8vo.

Illustrations of Himalayan Plants, chiefly . . . made for the late J. F. Cathcart . . . the plates . . . by W. H. Fitch. London, 1855. iv. pp., 24 pl. with descriptive text. fol.

On the structure of certain Limestone nodules enclosed in seams of Bituminous Coal, with a description of some Trigonocarpons contained in them. (By J. D. H. and E. W. Binney.) (Phil. Trans. 1855, pp. 149–156.)

On some minute seed vessels (*Carpolithes ovulum*, Brongniart) from the Eocene beds of Lewisham. (Journ. Geol. Soc. 1855, vol. xi. pp. 562–565.)

On some small seed-vessels (*Folliculites minutulus*, Bronn) from the Bovey Tracey Coal. (Journ. Geol. Soc. 1855, vol. xi. pp. 566–570.)

On *Hodgsonia*, Hook. fil. et Thoms., a new and remarkable genus of *Cucurbitaceae*. (Proc. Linn. Soc. 1855, vol. ii. pp. 257–259.)

On some remarkable spherical exostoses developed on the roots of various species of *Coniferae*. (Proc. Linn. Soc. 1855, vol. ii. pp. 335*–336*.)

On *Decaisnea*, a remarkable new genus of the tribe *Lardizabaleae*. (By J. D. H. and T. Thomson.) (Proc. Linn. Soc. 1855, vol. ii. pp. 349–351.)

On *Enkyanthus himalaicus* and *Cassiope selaginoides*, two new species of Himalayan *Ericaceae*. (By J. D. H. and T. Thomson.) (Hook. Kew Journ. Bot. 1855, vol. vii. pp. 124–126, pl. 3, 4.)

On *Chortodes*, a subgenus of *Flagellaria*, from the Isle of Pines (New Caledonia). (Hook. Kew Journ. Bot. 1855, vol. vii. pp. 198–200, pl. 6.)

Longevity of seeds. (Gard. Chron. 1855, pp. 805–806.)

1856.

On the structure and affinities of *Balanophoreae*. (Trans. Linn. Soc. 1856, vol. xxii. pp. 1–68, pl. 1–16.)

On three new species of *Acrotrema*, from Ceylon. (Hook. Kew Journ. Bot. 1856, vol. viii. pp. 241–243.)

Geographie Botanique Raisonée . . . par M. Alph. de Candolle ; a review (Hook. Kew Journ. Bot. 1856, vol. viii. pp. 54–64, 82–88, 112–121, 151–157, 181–191, 214–219, 248–256). Reprint. London, 1856.

1857.

On some Collections of Arctic Plants, chiefly made by Dr. Lyall, Dr. Anderson, Herr Miertsching, and Mr. Rae, during the Expeditions in search of Sir John Franklin, under Sir John Richardson, Sir Edward Belcher, and Sir Robert M'Clure. (Journ. Linn. Soc., Bot., 1857, vol. i. pp 114–124.)

On the botany of Raoul Island, one of the Kermadec group in the South Pacific Ocean. (Journ. Linn. Soc., Bot., 1857, vol. i. pp. 125–129.)

On the growth and composition of the ovarium of *Siphonodon celastrineus*, Griffith, especially with reference to the subject of its placentation. (Trans. Linn. Soc. 1857, vol. xxii. pp. 133–141, pl. 26.)

Descriptions of two new Dilleniaceous plants from New Caledonia and Tropical Australia. (Hook. Kew Journ. Bot. 1857, vol. ix. pp. 47–49, pl. 1, 2.)

On *Notospartium*, a new genus of *Leguminosae* from New Zealand. (Hook. Kew Journ. Bot. 1857, vol. ix. pp. 176–177, pl. 3.)

On *Bryocarpum*, a new genus of Himalayan *Primulaceae*. (By J. D. H. and T. Thomson.) (Hook. Kew Journ. Bot. 1857, vol. ix. pp. 199–200, pl. 5.)

On *Loxodiscus*, a new genus of *Sapindaceae*, from New Caledonia. (Hook. Kew Journ. Bot. 1857, vol. ix. pp. 200–201, pl. 6.)

On three new Indian *Scrophularineae*, with description of *Lancea*, gen. nov. (By J. D. H. and T. Thomson.) (Hook. Kew Journ. Bot. 1857, vol. ix. pp. 243–246, pl. 7, 8.)

On a new species of *Diapensia*, from the Eastern Himalaya. (Hook. Kew Journ. Bot. 1857, vol. ix. pp. 372–373, pl. 12.)

British North American Exploring Expedition [Additional Instructions]. (Hook. Kew Journ. Bot. 1857, vol. ix. pp. 216–219.)

1858.

Enumeratio plantarum Zeylaniae : an enumeration of Ceylon plants with descriptions of the new and little-known genera and species, observations on their habitats, uses, native names, &c. (By G. H. K. Thwaites, assisted by J. D. H.) London, 1858–1864. viii. + 483 pp. 8vo.

Praecursores ad Floram Indicam : being sketches of the natural families of Indian plants, with remarks on their distribution, structure, and affinities. (By J. D. H. and T. Thomson.) (Journ. Linn. Soc., Bot., 1858, vol. ii. pp. 1–29, 54–103, 163–180, pl. 2 ; 1860, vol. iv. pp. 106–157 ; 1861, vol. v. pp. 128–181.)

Cynoglossum nobile, n. sp. (Gard. Chron. 1858, p. 240.)

1859.

On the origin and development of the pitchers of *Nepenthes*, with an account of some new Bornean plants of that genus. (Trans. Linn. Soc. 1859, vol. xxii. pp. 415–424, pl. 69–74 ; translated in Ann. Sci. Nat., ser. 4, Bot., 1859, vol. xii. pp. 222–231.)

On a new genus of *Balanophoreae* (*Dactylanthus Taylori*) from New Zealand, and two new species of *Balanophora* (*B. Harlandi* and *B. Lowii*). (Trans. Linn. Soc. 1859, vol. xxii. pp. 425–427, pl. 75.)

1860.

The monstrous *Begonia frigida* at Kew, in relation to Mr. Darwin's "Theory of Natural Selection." (Ann. Nat. Hist. 1860, vol. v. pp. 350–352.)

Vaccinium rugosum, n. sp. (By J. D. H. and T. Thomson.) (Gard. Chron. 1860, p. 384.)

On the species of *Cordyline* now in cultivation from New Zealand and Australia. (Gard. Chron. 1860, pp. 791–792 ; translated in Belgique Horticole 1861, vol. xi. pp. 66–70.)

1861.

On *Fropiera*, a new Mauritian genus of calycifloral exogens, of doubtful affinity. (Journ. Linn. Soc., Bot., 1861, vol. v. pp. 1–2, pl. 1.)

On *Barteria*, a new genus of *Passifloreae*, from the Niger River. (Journ. Linn. Soc., Bot., 1861, vol. v. pp. 14–15, pl. 2.)

An account of the Plants collected by Dr. Walker in Greenland and Arctic America during the Expedition of Sir Francis M'Clintock, R.N., in the Yacht "Fox." (Journ. Linn. Soc., Bot., 1861, vol. v. pp. 79–88.)

Colonial Floras. (Nat. Hist. Review 1861, pp. 255–266.)

1862.

Genera Plantarum ad exemplaria imprimis in herbariis kewensibus servata definita. (By G. Bentham and J. D. H.) London, 1862–1883. 3 vols, 8vo. [For the joint and separate work of the authors, *see* Journ. Linn. Soc., Bot., 1883, vol. xx. pp. 304–308.]

Illustrations of the Floras of the Malayan Archipelago and of Tropical Africa. (Trans. Linn. Soc. 1862, vol. xxiii. pp. 155–172, pl. 20–28.)

Outlines of the distribution of Arctic plants. (Trans. Linn. Soc. 1862, vol. xxiii. pp. 251–348, with map ; pp. 251–276 and 281–309 reprinted in an abridged form in Admiralty Arctic Manual, London, 1875, pp. 197–238.)

On three Oaks of Palestine. (Trans. Linn. Soc. 1862, vol. xxiii. pp. 381–387, pl. 36–38.)

On the vegetation of Clarence Peak, Fernando Po ; with Descriptions of the Plants collected by Mr. Gustav Mann on the higher parts of that mountain. (Journ. Linn. Soc., Bot., 1862, vol. vi. pp. 1–23.)

On the Cedars of Lebanon, Taurus, Algeria, and India. (Nat. Hist. Review, 1862, pp. 11–18, pl. 1–3.)

1863.

On *Welwitschia*, a new genus of *Gnetaceae*. (Trans. Linn. Soc. 1863, vol. xxiv. pp. 1–48, pl. 1–14; translated in Flora, 1863, pp. 459–464, 473–479, 489–496, 506–510, 513–520; and in Diario de Lisboa, Jun. 2, 1863.)

On a new *Heliconia* with the habits of a *Musa*, sent from New Grenada by Dr. A. Anthoine to the Royal Gardens, Kew. (Journ. Linn. Soc., Bot., 1863, vol. vii. pp. 68–69.)

Note on the embryo of *Ancistrocladus*. (By J. D. H. and G. Bentham). (Journ. Linn. Soc., Bot., 1863, vol. vii. p. 111.)

The Botany of Syria and Palestine. (W. Smith's Dict. Bible, vol. ii., London, 1863.)

Enumeration of the Mountain Flowering Plants and Ferns . . . of the Camaroons Mountains, of Clarence Peak, Fernando Po, and of the Peak of San Thomé. (Burton: Abeokuta and the Camaroons Mountains, vol. ii. pp. 270–277. London, 1863.)

A. F. Henslow, Cotton and the want of it. London, 1863. 19 pp., 2 pl. 16mo. (Botanical description by J. D. H.)

1864.

Handbook of the New Zealand Flora, &c. London, 1864–67. 15* + lxviii. + 798 pp. 8vo.

On the Plants of the Temperate Regions of the Cameroons Mountains and Islands in the Bight of Benin; collected by Mr. Gustav Mann, Government Botanist. (Journ. Linn. Soc., Bot., 1864, vol. vii. pp. 171–240, pl. 1; pp. 171–181 translated in Petermann, Mitteilungen, 1865, pp. 22–26.)

On the Genus *Euptelea*, Sieb. & Zucc. (By J. D. H. and T. Thomson). (Journ. Linn. Soc., Bot., 1864, vol. vii. pp. 240–243, pl. 2.)

Note on the replacement of species in the Colonies and elsewhere. (Nat. Hist. Review, 1864, pp. 123–127.)

Epistephium Williamsii, n. sp. (Curtis's Bot. Mag. 1864, t. 5485.)

1865.

Curtis's Botanical Magazine, comprising the Plants of the Royal Gardens of Kew and of other botanical establishments in Great Britain; with suitable descriptions. Vols. xci.–cxxx. London, 1865–1904, pl. 5486–7991. 8vo. (Vols. cxxix–cxxx assisted by W. B. Hemsley.)

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Description of a new genus (*Brandisia*) of *Scrophularineae* from Martaban. (By J. D. H. and T. Thomson). (Journ. Linn. Soc., Bot., 1865, vol. viii. pp. 11–12, pl. 4.)

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Vol. II., 1876–1880. 792 + 1 pp.—*Sabiaceae*, *Anacardiaceae*, *Coriarieae*, *Moringeae*, *Connaraceae*, *Rosaceae*.

Vol. III., 1880–1882. 712 pp.—*Rubiaceae*, *Compositae*, *Primulaceae*, *Apocynaceae*.

Vol. IV., 1883–1885. 780 pp.—*Asclepiadaceae*, *Scrophulariaceae*, *Orobanchaceae*, *Selagineae*, *Labiatae*, *Plantagineae*, *Nyctagineae*, *Illecebraceae*, *Amarantaceae*.

Vol. V., 1886–1890. 910 pp.—*Chenopodiaceae*, *Phytolaccaceae*, *Polygonaceae*, *Podostemonaceae*, *Nepenthaceae*, *Cytinaceae*, *Aristolochiaceae*, *Piperaceae*, *Chloranthaceae*, *Myristiceae*, *Monimiaceae*, *Laurineae*, *Proteaceae*, *Thymelaeaceae*, *Elaeagnaceae*, *Loranthaceae*, *Santalaceae*, *Balanophoreae*, *Euphorbiaceae*, *Urticaceae* (excl. *Ficus* et *Artocarpus*), *Juglandeae*, *Myricaceae*, *Casuarineae*, *Cupuliferae*, *Salicineae*, *Ceratophylleae*, *Gnetaceae*, *Coniferae*, *Hydrocharideae*, *Burmanniaceae*, *Orchideae*.

Vol. VI., 1890–1894. 748 pp.—*Orchideae*, *Haemodoraceae*, *Irideae*, *Amaryllideae*, *Taccaceae*, *Dioscoreaceae*, *Roxburghiaceae*, *Liliaceae*, *Pontederiaceae*, *Philydraceae*, *Xyridaceae*, *Commelinaceae*, *Flagellarieae*, *Juncaceae*; *Palmeae* (with O. Beccari); *Pandaneae*, *Typhaceae*, *Aroideae*, *Lemnaceae*, *Triurideae*, *Alismaceae*, *Naiadaceae*, *Eriocauleae*.

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On *Hydrothrix*, a new genus of *Pontederiaceae*. (Ann. Bot. 1887, vol. i. pp. 89–94, pl. 7.)

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II.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECADES LXIII.-LXIV.

585 621. **Berberis (Sinenses) Stapfiana**, *C. Schneider* [Berberidaceae]; affinis *B. subcaulialatae*, C. Schneider, sed ab ea differt foliis minoribus, fructibus ellipticis minoribusque; a *B. Wilsonae*, Hemsley, et *B. Fineti*, C. Schneider, ramulis glaberrimis diversa.

Frutex parvus, glaberrimus, ramosissimus; rami fructiferi nigro-purpurascentes vel nigrescentes, divaricati, plus minusve angulati; spinae normales, 3-fidae, graciles, acutissimae, brunnescentes, subtus distincte sulcatae, mediae ad 1·3 cm. longae, laterales vix minores. *Folia* decidua, crasse membranacea, ad 4–8-fasciculata, oblanceolata, apice acuta vel obtusa vel rotundata, sed semper mucronata, integerrima, margine leviter revoluta, supra viridia, subtus albescentia vel paullo pruinosa, distincte papillosa, utrinque distincte anguste reticulata, minora 7 : 2, majora ad 22 : 4–5 mm. magna, in petiolum brevissimum attenuata. *Inflorescentiae* quam folia majora breviores, fasciculato-racemosae, 4–7-florae, leviter pruinosae. *Pedicelli* 3–4 mm. longi, basi bracteis duobus late ovatis acutis 6 mm. longis instructi. *Flores* flavi, globosi, 3–4 mm. in diametro. *Sepala* exteriora late ovata, interiora fere rotunda. *Petala* obovata, apice rotundata, basi breviter unguiculata, glandulifera, sepalis interioribus vix breviora. *Stamina* petalis breviora, apice obtusa. *Ovarium* staminibus aequilongum, ovulis 3 sessilibus instructum. *Fructus* elliptici, intense carmineo-colorati, leviter pruinosi, 5–6 mm. longi et 4–4·5 mm. crassi, stylo minimo sed distincto; semina 2, pallide flava.

China. Grown at Kew from a plant received from Les Barres, *Vilmorin*, No. 4039; from seeds from the Arnold Arboretum, Jamaica Plains, Mass., *Wilson*, 1284 (seed number); and from Messrs. Veitch & Sons, *Wilson*, 1560.

The above description was drawn up by Dr. Schneider from a specimen of *Vilmorin*, 4039, sent to him from Kew, where it was grown.

This species seems to be a very distinct one. It is nearly related to some other small Chinese *Berberis* of the same external appearance, and it looks very like *B. subcaulialata*, C. Schn., but this species has somewhat larger leaves and globose fruits. *B. Wilsonae*, *B. aggregata* and *B. Fineti* differ from the new one by distinctly puberulous branches and in some other respects. *B. elegans*, C. Schn., recedes by its stalked corymbs and different reticulated leaves.

622. **Decáschistia rufa**, *Craib* [Malvaceae-Hibisceae]; *D. crotonifoliae*, Wight et Arn., affinis sed indumento ramulorum rufo foliorum pagina inferiore longiore, bracteolis majoribus, seminibus vix glabris recedit.

Ramuli apice dense rufo-hirsuti, dein pallidiores, minutissime tomentelli. *Folia* subrotundata, ovato-elliptica, elliptica vel oblongo-elliptica, apice breviter acuminata, acuta vel subobtusa,

basi rotundata, subcordata, 3–10 cm. longa, 1·5–7 cm. lata, coriacea, supra breviter molliter stellato-pubescentia, subtus densius fulvo-pubescentia, margine dentata, crenato-serrata vel denticulata, e basi 5-nervia duobus inferioribus minus conspicuis, nervis secondariis (e costa ortis) utrinque circiter 4 supra subconspicuis subtus prominentibus, nervis transversis supra plerumque leviter impressis subtus prominulis ; petioli 0·5–3 cm. longi, indumento ut in ramulis ; stipulae deciduae. *Pedicelli* in fructu validi, ad 2·4 cm. longi, indumento ut in ramulis. *Bracteolae* basi plus minusve connatae, acuminatae, subacutae, ad 1 cm. longae et 4 mm. latae, indumento extra ut in pedicellis, intra parcius appresse pubescentes. *Calyx* infructescens 1·5 cm. longus, lobis late triangularibus acuminatis obtusiusculis ad 1 cm. longis 0·6 cm. latis conspicue nervatis, extra indumento ut in ramulis, intra superne tenuiter appresse pubescens. *Corolla* circiter 6 cm. longa. *Tubus* staminalis circiter 2 cm. longus, filamentis ad 2 mm. longis glabris. *Capsula* calycem vix aequans, dense hirsuta ; semina fusca, ad 5 mm. longa, parcissime brunneo-pilosula.—*D. crotonifolia*, Masters in Fl. Brit. Ind., vol. i. p. 332 in part, vix Wight et Arn.

India. Pen. Ind. Or. : without precise locality, *Herb. Rottler*, et *Wall. Cat.* 1901 in part. ? Madras, Tiruvallur, Kumbākkam Drug, *Cleghorn in Herb. Foulkes.*

623. **Rubus conduplicatus**, *Duthie* [Rosaceae-Rubeae] ; affinis *R. triantho*, Focke, sed foliorum facie inferiore pallide viridi, non alba, floribus minoribus, aculeis caulium vetustiorum robustioribus et magis curvatis differt ; etiam *R. inciso*, Thunb. comparandus, sed foliis ovato-lanceolatis, paniculis 3–4-floris, haud unifloris, recedit.

Frutex scandens, eglandulosus, glaber, calycis loborum facie interiore excepta. *Caules* et ramuli primarii nigro-purpurei, glabri et saepius glaucescentes, juniore rubri, aculeis plerumque curvatis. *Folia* simplicia, petiolata ; lamina 3·8–7 cm. longa et 2·5–5 cm. lata, ovato-lanceolata, acuminata, interdum subtrilobata, basi cordata, rarius rotundata, subtus pallide viridia, marginibus inaequaliter inciso-serratis, costa et nervis primariis subtus prominentibus rubro coloratis sparse aculeatis. *Flores* in paniculas laxas 3–4-floras terminales dispositi, 1·3–1·9 mm. diametro, pedicellis gracilibus, 1·3–2·5 cm. longis ; bracteae anguste lanceolatae, deciduae. *Calyx* extra glaber, nigro-purpureus, tubo hemispherico, lobis erectis tubo longioribus triangularibus cuspidatis et apice reflexis intus albo-sericeis. *Corolla* alba ; petala 6–12 mm. longa, deflexa, conduplicata, marginibus undulatis. *Ovarium* glabrum, stylo ad basim sericeo, receptaculo pubescenti. *Carpella* matura glabra, putamine reticulato.

Central China. Mountains of N.W. Hupeh, *E. H. Wilson*, 904.

624. **Rubus Wilsonii**, *Duthie* [Rosaceae-Rubeae] ; species ex affinitate *R. inoperti*, Focke, a quo foliis 1–2-jugis et calyce extra brunneo-purpureo recedit.

Frutex scandens. *Caules* teretiusculi, spinosissimi, brunneo-purpurei, glaucescentes ; ramuli quadrangulares, rubro-purpurei, glauci, angulis praesertim infra nodos subalatis. *Folia* pinnatim 1–2-juga, usque ad 15 cm. longa, petiolis rhachique aculeis paucis

gracilibus armatis ; foliola membranacea, grosse duplicato-serrata, supra rugosa, saturate viridia, glabra, subtus pallidiora, basi plus minusve cordata, costa subtus sparse aculeata, nervis primariis 6–8-jugis sursum paullum arcuatis ; foliola lateralia subsessilia, 4–5 cm. longa, inaequaliter ovata, acuta vel acuminata ; foliolum terminale late ovatum vel suborbiculare, supra medium interdum leviter trilobatum, basi rotundata vel subcordata ; stipulae oblique lanceolatae, acuminatae, glabrae. *Flores* in fasciculos axillares et terminales breves paniculatos dispositi ; fasciculi terminales 4–5-flori, axillares 2–3-flori ; pedicelli 0·6–1·3 cm. longi, glabri, saepe paucis parvis aculeis armati ; bracteae 3–6 mm. longae, cymbiformes, glabrae. *Calyx* extra valde brunneo-purpureus, glaber, intus dense albo-sericeus ; lobi ovati, apice cuspidati, reflexi, marginibus obtectis interiorum loborum etiam albo-sericeis. *Petala* 8 mm. longa et lata, purpurea, marginibus erosis. *Carpella* stylique pilosi.

Central China. Mountains of Hupeh, *E. H. Wilson*.

The above description was prepared from living specimens supplied by Messrs. J. Veitch & Sons, which had been raised by them from seed sent to them by Mr. Wilson from China in 1901.

4728 625. **Cyananthus cordifolius**, *Duthie* [Campanulaceae-Campanuleae]; affinis *C. pedunculato*, C. B. Clarke, sed foliis basi cordatis, marginibus crenatis.

Herba perennis. *Caules* 14–27 cm. longi, sparse pilosi vel glabri, basi prostrati et interdum ramulis sterilibus ex axillis inferioribus productis. *Folia* sessilia, 1–1·5 longa et ·8–·9 cm. lata, triangulari-ovata, obtusa vel subacuta, supra glabra vel sparse pilosa, infra constanter albo-pilosa, basi cordata, marginibus crenatis revolutis ; folia ramulorum sterilium multo minora, elliptico-ovalia, subintegra, basi rotundata, rarius obscure cordata. *Flores* pedunculati, 5–meri, pedunculis 1–1·5 cm. longis nigro-villosis. *Calyx* 1·5–2 cm. longus, fere ad medium divisus, pilis nigris longis hirsutus ; lobi lanceolati, acuti, apice saepius reflexi. *Corolla* coerulea, glabra, 2·5–3 cm. longa, ad mediam divisa ; lobi apice rotundati.

Himalaya. Western Nepal : Nampa Gádh, circa 3350 m., *Duthie*, 5730. N. Kumaon : Kutti Yangti Valley, circa 3960 m., *Duthie*, 3114.

626. **Syringa** (§Vulgares) **Julianae**, *C. Schneider*, Ill. Handb. Laubholzk., vol. ii. p. 777, Dec. 1911, sine diag. lat. [Oleaceae]; affinis *S. pubescenti*, Turcz., sed foliis minoribus etiam supra puberulis brevius petiolatis, floribus minoribus, antheris paulo infra faucem corollae tubo insertis differt.

Frutex ut videtur breviter denseque ramosus. *Ramuli* usque annum secundum plus minusve pubescentes, deinde glabri, cinerascentes. *Folia* ramulorum floriferorum ovalia, basi apiceque acuta vel subacuta, supra viridia, plus minusve puberula, subtus pallidiora, distinctius (praesertim ad nervos) pubescentia, 2·5–4·3 cm. longa et 1–2·3 cm. lata ; petioli 3–5 mm. longi, puberuli. *Inflorescentiae* satis parvae, ad 6 cm. longae, modo ramulorum pubescentes, erectae ; pedicelli puberuli, brevissimi. *Flores* albo-rosei ; tubus circa 6 mm. longus ; laciniae corollae 2–2·5 mm. longae, subacutae, explanatae ; calyx glaber, violaceus, laciniae brevissimae, sed satis distinctae, acutae. *Antherae* violaceae, in sieco nigrescentes. *Fructus* ignoti.

CENTRAL CHINA. Introduced by Mr. E. H. Wilson.

This is a very distinct species, a member of the section *Vulgares* subsect. *pubescentes*, closely allied to *S. pubescens* by the dark-red—not yellow—anthers.

627. **Zschokkea Foxii**, *Stapf* [Apocynaceae-Carisseae]; affinis *Z. utili*, Hemsl., sed foliis majoribus, nervis magis numerosis supra haud impressis, corollae segmentis oblongis duplo longioribus, antheris longioribus differt.

Arbor alta, glaberrima, ramulis florentibus fuscis apicem versus leviter compressis. *Folia* elliptica, basi breviter acuta, apice breviter acuminata acumine obtusiusculo, 4·5–7 cm. longa, 2·2–3·5 cm. lata, coriacea, exsiccando supra brunnea vel fusca, infra ochreo-brunnescentia, et minute nigro-punctata, costa supra leviter canaliculata infra prominente, nervis utrinque 15–17 tenuibus margines versus arcuatim connectis supra obscure prominulis; petiolus 8–9 mm. longus, latiusculus, canaliculatus. *Flores* albi, in corymbos axillares breviter pedunculatos multifloros dispositi; pedunculi ad 4 vel 5 mm. longi; bracteae ovatae, acutae, 1–2 mm. longae; pedicelli ad 3 vel 4 mm. longi, praeter alares 2-bracteolati, bracteolis 1 mm. longis ovatis. *Calyx* 2·5 mm. altus; segmenta elliptico-ovata, obtusa, minute ciliolata. *Corolla* alba, 15 mm. longa, tubo cylindrico ima basi et supra medium paulo ampliata, lobis oblongis 2·5 mm. longis. *Antherae* subulato-lineares, tenuiter acuminatae, fere 5 mm. longae, cruribus basalibus 1 mm. longis. *Stylus* cum stigmate 5 mm. longus, stigmatis cruribus tenuiter subulatis fere 2 mm. longis. *Fructus* ignotus.

PERU. Putumayo Territory: Entre Rios and Sabana (about 72° W. Long., 1° S. Lat.), *Fox*, 31.

Vernacular name: "Minyadotana."

This tree, according to Mr. Fox, yields a latex which is used for mixing with *Hevea* and *Castilloa* rubber.

628. **Strychnos similis**, *A. W. Hill* [Loganiaceae]; species *S. multiflorae*, Benth. et *S. lanatae*, *A. W. Hill*, affinis sed ab ambabus antheris fusco-viridibus basi barbatis et a *S. multiflora* stylo basi hirsuto differt.

Folia anguste elongata-elliptica, acuminata, basi cuneata, 5-nervia, conspicue triplinervia, 12–15 cm. longa, 3·5–4 cm. lata, subcoriacea; petiolus circiter 1 cm. longus. *Inflorescentia* axillaris, paniculata, multiflora, pedunculis plus minusve glabris pedicellis fusco-tomentosis; bracteis ovatis marginibus breviter ciliatis. *Flores* in cymas trifloras dispositi, pedicellis circiter 3 mm. longis. *Calyx* 1 mm. longus, segmentis ovatis obtusis marginibus ciliatis. *Corolla* 5·5 mm. longa, lobis 2·75 mm. longis anguste ovato-lanceolatis acutis inferne et corollae fauce hirsutis. *Stamina* filamentis 0·75 mm. longis; antherae fusco-virides basi barbatae. *Ovarium* globosum, 8 mm. diametro, hirsutum; stylus 3·5 mm. longus, basi hirsutus. *Fructus* ignotus.

PHILIPPINE ISLANDS, Mindanao: Province of Surigao; Hinatuan (E. coast), *C. V. Piper*, 504.

The specimen on which this species has been founded was sent to Kew by Mr. E. D. Merrill and arrived shortly after the paper

on *Strychnos Ignatii*, etc., was published (*K. B.* 1911, pp. 281–303). This new species closely resembles *S. multiflora* and its allies *S. dubia* and *S. lanata*, but differs especially in its bearded, dark green anthers. It was collected on the E. coast of Mindanao, a locality from which we have no previous collections.

629. **Paracaryum trinervium**, *Duthie* [Boraginaceae-Cynoglosseae]; affinis *P. himalayensi*, C. B. Clarke, sed foliis conspicue trinerviis, floribus multo majoribus et calycis lobis latioribus differt.

Herba perennis. *Caulis* erectus, ramosus, superne sericeo-pilous. *Folia* (caulina) sessilia, 5–8 cm. longa et 0·7–1·3 cm. lata, lineari-lanceolata, acuta, valde trinervia, dense et molliter pilosa, demum pilis rigidis e tuberculo ortis asperrima. *Racemi* fructiferi elongati, asperi, pedicellis calyce brevioribus. *Calyx* 3·5 mm. longus, prope ad basim divisus, dense canescenti-pilosus, lobis ovatis obtusis vel subacutis intus glabratis. *Corolla* rotata, coerulea, 6 mm. diametro, tubo 2 mm. longo, lobis late obovatis, ad apicem rotundatis, integris, squamis late reniformibus. *Antherae* inclusae, 1 mm. longae, oblongo-ovales. *Stylus* 1 mm. longus. *Nuculae* ovatae, 4–5 mm. longae, marginibus dentatis, dentibus glochidiatis ; disco aculeato.

Eastern Tibet. Lhasa, circa 3650 m., *Waddell.*

630. **Eritrichium densiflorum**, *Duthie* [Boraginaceae-Eritrichieae]; ex affinitate *E. Monroi*, C. B. Clarke, sed habitu robustiore, ramis suberectis, nuculis transverse rugosis dorsoque punctato-excavatis differt.

Herba perennis, minuta, tota canescenti-pilosa vel hispida. *Caules* ramosi, rigidi, 5–7 mm. longi, adpresse pilosi. *Folia* sessilia, saepe basi amplexicaulia, usque ad 15 mm. longa, ovata, obovato-oblonga vel oblanceolata, obtusa vel subacuta, utrinque adpresse pilosa, demum crassa et setosa, setis tuberculo insidentibus. *Flores* numerosi, in cymata racemosa dense compacti, pedicellis brevissimis, superioribus ebracteatis, bracteis foliaceis. *Calyx* 3 mm. longus, 5-partitus, in fructu parum auctus, lobis linearibus, extra setis rigidis indutis. *Corolla* 2 mm. longa et lata, tubo calyce longiore albo vel pallide flavo, lobis obovatis coeruleis vel albis apice rotundatis, squamis exsertis subquadratis emarginatis. *Filamenta* ad mediam corollam affixa, antheris dimidio breviora. *Nuculae* ovatae, dorso punctato-excavatae, minute hispidae, marginibus integris.

Eastern Tibet. Yan Dho Cho, *Younghusband*, 1551 ; Sangpo Valley, *Walton*, 1550 ; Gyangtze, *Walton*, 1552, 1553 ; Pembu La, *Walton*, 1547 ; Lhasa, circa 3650 m., *King's collector*, 276, 1548, 1549.

E. densiflorum was also collected by Sir Joseph Hooker in Sikkim at elevations between 3960 and 4360 m. This is the *Eritrichium* No. 13 (in part) of Hook. f. and Thoms. Kew Distrib. It has also more recently been obtained by Strachey & Duthie in N. Kumaon. *E. Monroi* is widely distributed along the inner ranges of the Himalaya, and it is quite possible that further careful study of the ample material in the Kew Herbarium may necessitate the recognition of other species quite as distinct as the subject of this notice.

631. **Microula pustulata**, *Duthie* [Boraginaceae-Eritrichieae]; sub *Eritrichio pustulato*, C. B. Clarke in Fl. Brit. Ind. iv. 164;

habitu ad *M. sikkimensem*, Hemsl., accedit, sed statura minore, caulibus basi procumbentibus, inflorescentia omnino dissimili, floribus minoribus recedit.

Descr. emend. *Herba* perennis, rhizomate verticali sublignoso. *Caules* numerosi, adscendentes vel prostrati, adpresse pilosi vel saepe patule setulosi. *Folia* 1–4 cm. longa, elliptico-obovata vel spathulata, utrinque canescenti-strigosa, inferiora in petiolum attenuata. *Racemi* pauciflori, terminales vel laterales, bracteati. *Flores* minuti, inferiores saepius solitarii et suboppositifolii; pedicellii calycem aequantes, fructiferi elongati arcuati. *Calyx* dense sericeo-pilosus, 2·5 mm. longus, post anthesim parum auctus, lobis 2 mm. longis triangulari-lanceolatis obtusis. *Corolla* coerulea, 3 mm. longa; lobi 1 mm. longi, oblongi, rotundati, squamis reniformibus. *Antherae* sessiles, inclusae. *Nuculae* 2 mm. longae, rhomboideo-ovatae, tuberculatae, hispidulae, tuberculis setis minutis coronatis, dorso supra medium foveola ovata munitae.

Eastern Tibet. Chumbi; Syampoo, *King's collector*, 126 (1884).

This plant, which was originally discovered by Sir Joseph Hooker in Sikkim at elevations between 4000 and 4500 m., is the *Eritrichium* No. 14 of Hook. f. and Thoms. Kew Distrib., and the type of *E. pustulatum*, C. B. Clarke in Fl. Brit. Ind. l.c. Additional material was obtained by the present writer in 1884 on the mountains of N. Kumaon at elevations of about 4360 m. The nutlets are very similar to those of *M. sikkimensis*, having the same characteristic tubercles tipped with minute bristles.

3502 632. **Microula Younghusbandii**, *Duthie* [Boraginaceae-Eritrichieae]; affinis *M. tibeticae*, Maxim., sed omnino minor et calycis lobis longioribus et suberectis, nuculis laevibus, foveola lineari subapicali recedens.

Herba exigua, perennis, subacaulescens, tota appresse pilosa. *Rhizoma* verticale, 3–6 cm. longum, crassum. *Folia* utrinque canescenti-pilosa, demum setis paucis tuberculo insidentibus munita; radicalia 1–1·5 cm. longa, lineari-lanceolata vel spathulata, obtusa vel subacuta, basi in petiolum attenuata; folia caulina breviora et ex proportione latiora, elliptica vel oblanceolata. *Flores* coerulei vel albi, in cymata densa bracteata dispositi; bracteae (folia floralia) floribus longiores, oblongae vel obovatae, obtusae; pedicelli calyce breviores. *Calyx* circa 2 mm. longus, prope ad basin divisus, extra pilosus, lobis lanceolatis acuminatis intus glabratis. *Corolla* rotata, 3 mm. diametro; tubus calyce paulo brevior, lobis obovatis; squamae exsertae, subreniformes. *Antherae* infra squamas inclusae. *Stylus* inclusus. *Nuculae* laeves, ad dorsum supra medium foveola lineari crasse marginata instructae.

Eastern Tibet. Gyamptsoma, near the source of the Tista, at about 4850 m., *Younghusband*, 1554.

3217 633. **Onosma longiflorum**, *Duthie* [Boraginaceae-Lithospermeae]; affinis *O. Hookeri*, C. B. Clarke, sed floribus multo longioribus, filamentis non dilatatis, nuculis tuberculatis differt.

Herba perennis, basi suffrutescens. *Caules* erecti vel adscendentes, subangulati, sulcati, puberuli et setis patentibus rigidis albis induti. *Folia* subcoriacea, 4–7 cm. longa et 5–7 mm. lata, utrinque minute

et dense puberula, supra omnino et subtus ad costam valde setosa ; folia inferiora oblanceolata, obtusa vel subacuta, in petiolum attenuata ; superiora sessilia, lineari-lanceolata, acuta. *Racemi* terminales, divaricati ; bracteae calyce breviores, anguste lineari-lanceolatae, acuminatae, setulosae. *Calyx* 15 mm. longus, prope ad basin partitus, laciniis lanceolatis acuminatis extra dense setosis intus glabratis. *Corolla* coeruleo-purpurea, 3 cm. longa, sericeo-velutina, tubuloso-infundibuliformis ad basin attenuata, lobis brevibus rotundatis reflexis. *Filamenta* haud dilatata. *Nuculae* triquetrae, apice abrupte acutae, non nitidae, dorso tuberculatae.

Eastern Tibet. Gyantze, *Walton*, 57 and 1561 ; Lhasa, circa 3650 m., *Waddell.*

3232 634. **Onosma Waltoni**, *Duthie* [Boraginaceae-Lithospermeae] ; ex affinitate *O. Waddellii*, Duthie, sed herba robustior et magis erecta, floribus majoribus et cymis in fructu paullo elongatis.

Herba perennis, basi suffrutescens, tota setis tuberculo insidentibus asperrima. *Caules* robusti, suberecti, minute puberuli, etiam pilis rigidis deflexis intermixtis. *Folia* sessilia, semi-amplexicaulia, 2–4 cm. longa et 6–8 mm. lata, oblongo-lanceolata, apice obtusata, obscure mucronata, utrinque dense puberula, pagina superiore et costa infra valde setosis. *Cymata* sub anthesin pseudo-capitata, in fructu paulo elongata, foliis floralibus ovato-lanceolatis obtusis. *Calyx* 5–8 mm. longus, prope ad basin divisus, extra dense setosus, intus glaber, laciniis lineari-lanceolatis demum accrescentibus. *Corolla* coerulea, 1–3 cm. longa, tubuloso-campanulata ; lobi depresse triangulares, marginibus reflexis, apice calloso. *Filamenta* infra medium corollam connata ; antherae parum exsertae. *Stylus* in fructu longe exsertus. *Nuculae* 3 mm. longae, obscure tuberculatae, nitidae.

Eastern Tibet. Gyantze, *Walton*, 60, 1560 & 1562.

3249 635. **O. Waddellii**, *Duthie* [Boraginaceae-Lithospermeae] ; affinis *O. Waltoni*, Duthie, sed caulibus gracilioribus et decumbentibus, cymis laxis et in fructu elongatis, filamentorum parte dilatata libera, nuculis haud nitidis differt.

Herba perennis. *Caules* decumbentes, quadrangulares, sulcati, patule setosi. *Folia* 1·5–3·5 longa et 4–9 mm. lata, lineari-oblonga vel oblanceolata, obtusa vel subacata, utrinque minute hispida, supra etiam setis longis tuberculo insidentibus instructa. *Cymata* brevia, pseudo-capitata, in fructu elongata ; bracteae inferiores foliaceae, supremae lineares, calyce breviores. *Calyx* 4 mm. longus, prope ad basin divisus ; laciniae anguste lineari-lanceolatae, extra dense canescenti-pilosae. *Corolla* coerulea, campanulata, 1 cm. longa, ad basin flavescens, lobis parvis triangulatis, apice reflexo calloso. *Filamenta* 5 mm. longa, sursum ad mediam coerollam dilatata, parte dilatata libera ; antherae longe exsertae, atro-coeruleae. *Stylus* post anthesin elongatus. *Nuculae* 3 mm. longae, ovoideae, grosse tuberculatae, haud nitidae.

Eastern Tibet. Lhasa, circa 3650 m., *Waddell* ; Sangpo Valley, circa 4600 m., *Walton* ; North of Phári, *King's Collector*, (363 & 365 of Herb. Calc.).

636. **Columnea** (**Eucolumnea**) **Fendleri**, *Sprague* [Gesneriaceae] ; affinis *C. scandenti*, Linn., a qua calycis segmentis magis attenuatis

inferne utrinque longe unidentatis, corollae tubo longiore, corollae limbo breviore recedit.

Caulis obtuse tetragonus, in sicco vix 5 mm. crassus. *Folia* elliptico-oblonga, apice obtusa, basi inaequalia, obtusa, 2·5–4·5 cm. longa, 1–1·5 cm. lata, rubro-marginata, supra appresse hirsutula, subtus grosse sericeo-hirsuta ; nervi laterales utrinque 4, obliqui ; petioli 3–5 mm. longi. *Pedicelli* 1·3–1·7 cm. longi. *Calycis segmenta* erecta, basi circiter 0·5 mm. connata, circiter 3 mm. supra basin utrinque patule unidentata dentibus linearibus 2–2·5 mm. longis, in toto 1·5 cm. longa, ad insertionem dentium 2 mm. lata, abhinc deorsum leviter angustata, sursum sensim attenuata, trinervia, extra conspicue, intus brevius parcius hirsuta. *Corolla* circiter 6·5 cm. longa ; tubus gracilis, circiter 4 cm. longus, sursum paulo ampliatus ; limbus 2·3–2·5 cm. longus ; lobus anticus oblongo-lanceolatus, 1·2 cm. longus, 3·5 mm. latus ; lobi laterales circiter 1 cm. galeae adnati marginibus superioribus circiter 8 mm. longis ; galeae pars libera 1·5 cm. longa, 1·1–1·2 cm. lata, apice cuneato-rotundata, apiculata. *Vagina staminalis* medio 7 mm., lateribus 6 mm. longa, corollae tubo 3 mm. adnata ; antherae 2 mm. longae. *Disci glandula* unica, 1·6 mm. longa. *Ovarium* ovoideum, 2·75 mm. longum, glabrum ; stylus inferne glaber, superne pilosus.

Venezuela. Near Colonia Tovar, *Fendler*, 2031.

Hanstein in Linnaea, vol. xxxiv. p. 104, included under *C. scandens*, Linn., a specimen in the Berlin herberium collected at Puerto Cabello, Venezuela, by Karsten. According to Urban, Symbolae Antillanae, vol. ii. p. 360, Karsten's specimen represents a distinct species or variety. Hanstein stated that the calyx segments were more evidently toothed than in typical *C. scandens*, and Urban mentions that the corolla is long-attenuate below. It is therefore probable that Karsten's specimen is referable to *C. Fendleri*.

637. **Columnea (Eucolumnea) Tuerckheimii**, *Sprague* [Gesneriaceae]; affinis *C. gloriosae*, Sprague, a qua caulibus gracilibus, foliis pro rata minus obliquis, calyce extra sparsius piloso loborum marginibus remote denticulatis haud reflexis, corolla sursum minus expansa galea angustiore, antheris brevioribus recedit.

Planta in arboribus epiphytica ramis pendulis. *Ramuli* graciles, in sicco 1·2 mm. diametro 30 cm. infra apicem, angulati, costati, pilis patentibus pluricellularibus acutis hirsuti. *Folia* leviter anisophylla, juvenilia marginibus reflexis, adulta plana, elliptico-oblonga vel ovato-oblonga, apice acuta, basi rotundata vel subcordata, 2·5–4 cm. longa, 1·3–1·9 cm. lata, exsiccando membranacea, supra hirsuta, subtus nervis hirsutis ceterum parce inconspicue pilosula ; nervi laterales utrinque 4, leviter curvati tantum, supra vix visi, subtus prominuli ; petioli 2–4 mm. longi. *Pedicelli* circiter 1 cm. longi, hirsuti. *Calycis segmenta* breviter late unguiculata, patentia, ovato-oblonga, ungue incluso 1·2 cm. longa, 6–6·5 mm. lata, remote denticulata denticulis utrinque 2–3 infimis 0·8–1·3 mm. longis superioribus minoribus, supra longe dense subtus parce hirsuta. *Corolla* 6·2–6·5 cm. longa, coccinea ventre luteo, extra parciuscule villosa ; tubus circiter 2·5 cm. longus ; lobus anticus oblongo-lincaris vel anguste oblongus, 2–3 cm. longus, 4–6·5 mm. latus ; lobi laterales 2·4–2·9 cm. galeae adnati ; galeae pars libera 1·3–1·4 cm. longa, 1·9–2·2 cm. lata, subtruncata. *Antherae* 2–2·3 mm. longae.

Disci glandula unica, e basi 1 mm. lata oblonga, 1·5 mm. longa, superne 0·4 mm. lata, retusa. *Ovarium* 3 mm. longum, dense appresse villosum villis erectis.—*Columnea microcalyx*, Donnell Smith, Enum. Pl. Guatem. vol. vi. p. 30, non Hanst.

GUATEMALA. Department of Alta Verapaz: Cubilquitz, 350 m., *Tuerckheim in Donnell Smith*, 7640.

In the description of *C. gloriosa* the length of the anthers was omitted: they are 3 mm. long.

2068 638. **Incarvillea Wilsonii**, *Sprague* [Bignoniaceae]; affinis *I. Beresowskii*, Batalin, a qua pedicellis longioribus bracteas excedentibus, calyce majore, corollae limbo magno recedit.

Herba 1–2 m. alta, caule ramoso folioso, primo visu glabro, revera minute parcissime glanduloso. *Folia* radicalia (vel caulina inferiora ?) longipetiolata, in toto circiter 40 cm. longa, pinnatipartita, rhachi anguste alata late sulcata supra minute densiuscule subtus parce glanduloso-pilosa, segmentis suboppositis 5–6-jugis lanceolato-oblongis apice acutis basi inaequilateris obtusis 5·5–8·5 cm. longis 2–3 cm. latis crenato-serratis utrinque minnte parce glandulosis; petioli circiter 15 cm. longi; folia superiora similia, minora, segmentis circiter 3-jugis. *Racemi* terminales, multiflori (fide *Wilson*), et axillares vel ramulos axillares foliatos terminantes, internodiis sub anthesi usque ad 4 cm. longis; bracteae 3–8 mm. longae; pedicelli circiter 1 cm. longi, bracteis saepius duplo raro vix longiores, satis glandulosi. *Calyx* campanulatus, quinquecostatus, in toto 1·5–2 cm. longus, extra minute parce glandulosus; lobi late deltoidei, cuspidati, 4–6 mm. longi, apice uncinati. *Corolla* carmineo-rubra; tubus 4·5 cm. longus; limbus 5–5·5 cm. diametro densiuscule minute nigrescenti-punctatus. *Capsula* subacinaciformis, compresso-tetragona, 8–10 cm. longa, 11–12 mm. lata, circiter 7 mm. crassa, in apicem anguste truncatum breviter acuminata, a medio deorsum angustata, utrinque superne plana, inferne convexa; valvae fuscae, sublignosae; septum albidum, nitidulum, cicatricibus seminum utrinque medio septi triseriatis superne et inferne uniseriatis. *Semina* lenticularia, alata, cum ala 5–5·5 mm. diametro, sine ala 3 mm. diametro, superficie altera glabra, altera dense furfuraceo-pilosa; tegmen basi et apice testae affixum, in aqua membranaceum, in sicco tenuiter pergamentaceum. *Embryo* suborbicularis, 2·75 mm. diametro; cotyledones apice retusae, basi anguste cordatae, radicula vix exserta.

CHINA. Western Szechuan: Hsao Chin Ho valley; near Monkong Ting, 2100-2400 m., *Wilson*, 3058.

639. **Amorphophallus Kerrii**, *N. E. Brown* [Aroideae-Pythonieae]; affinis *A. chlorospathae*, Kurz, sed folii segmentis lanceolatis quadruplo latioribus, spadice breviore et antheris albis differt.

Herba tuberosa, perennis. *Folium* solitarium, erectum, glabrum; petiolus 1 m. longus, viridis, albido-viridi-maculatus; lamina trisecta, ramis unifurcatis pinnatisectis; segmenta inferiora 5–7·5 cm. longa, 3–5·5 cm. lata, elliptica vel lanceolata; segmenta ultima 15–21·5 cm. longa, 5·5–7 cm. lata, lanceolata, acuta, basi in alam 4–8 mm. latam decurrentia. *Pedunculus* 25 cm. longus, 1 cm. crassus, olivacco-brunneus, ocellis albido-viridibus maculatus. *Spatha* erecta, 15–18 cm. longa, 5 cm. lata, lanceolata, concava, apice leviter procurva, acuta, basi breviter convoluta, marginibus

haud undulatis, viridis, ocellis albido-viridibus maculata. *Spadix* spatha multo brevior, stipitata ; pars feminea 1·5–2·5 cm. longa, 1·5 cm. crassa, cylindrica, viridis ; ovarium globosum, in stylum 1·5 mm. longum contractum, stigmate punctiformi ; pars mascula 1·5–2·5 cm. longa, 1·2–2·3 cm. crassa, cylindrica vel ellipsoidea, alba ; appendix 3·8-4 cm. longa, 1·6–2·5 cm. crassa, subcylindrica vel obtuse trigono-ovoidea, laevis, lacteo-alba vel pallide luteo-viridis.

Siam. Collected in the Chiengmai District by *Dr. A. F. G. Kerr*, and sent to the Trinity College Botanic Garden, Dublin, where it flowered in March, 1910, and March, 1911, the leaf appearing in the following May.

No dried specimens of this species have yet been received from Dr. Kerr, so that it may be a somewhat rare or very local plant.

640. **Sciaphila australasica**, *Hemsl.* [Triuridaceae] ; species perianthii lobis inappendiculatis.

Herba perennis, monoica vel dioica, saprophytica, aphylla, praeter radices pilosas glaberrima. *Caules* gracillimi, erecti, 8–23 cm. alti, simplices vel pauciramosi, ramis strictissimis, basi radices pilosas simplices vel perraro pauciramosas 2–5 cm. longas novellas sursum ordinatim emittentes, infra medium nudi vel squamis paucis minutis instructi. *Flores* racemosi, minuti, unisexuales, saepius dioici, raro monoici, si monoici superiores masculi ; bracteae lanceolatae, 2–3 mm. longae, acutissimae, persistentes ; pedicelli capillares, 0·5–2 cm. longi. *Perianthium florum* ♂ alte 5-lobum (an semper ?) ; lobi ovato-lanceolati, circiter 0·75 mm. longi, obtusi, inappendiculati, incurvi. *Stamina* 3, subsessilia ; antherae rima transversa dehiscentes. *Perianthium florum* ♀ saepius 6-lobum ; lobi lanceolati, circiter 1 mm. longi, obtusi, inappendiculati, demum recurvi. *Carpella* numerosa ; stylus supra carpelli medium lateralis, ventralis, filiformis, 2–3 mm. longus. *Carpella matura*, ut videtur, carnosa, globoso-obconica, 1–1·25 mm. longa, laevia, monosperma. *Semen* fusiforme, 0·75–1 mm. longum, utrinque obtusum ; testa longitudinaliter subtiliter striata. *Embryo* mihi ignotus.

Australia. Queensland : Bellenden Ker Hills, at about 1000 m., *K. Domin.*

This is apparently the only member of the family hitherto discovered in Australia. It was growing in a dense mass of fine foreign roots, from which it was with difficulty extricated intact.

Some of the seeds were occupied by a solitary larva.

III.—A DISEASE OF SWEET PEAS, ASTERS, AND OTHER PLANTS.*

(*Thielavia basicola*, Zopf.)

(With Plate.)

G. Massee.

A disease attacking asters, sweet peas and various other cultivated plants, more especially during the seedling stage

* This article was printed in November, 1911, but had to be held over to this number owing to lack of space in the *Bulletin* for last year.

caused by a minute parasitic fungus, *Thielavia basicola*, Zopf, has become so prevalent during recent years, that in some localities their cultivation has been practically abandoned. The receipt at Kew of a considerable amount of diseased material in a condition favourable for investigation, has led to the discovery of the cause of the disease and also of measures whereby the danger can be prevented.

Morphology, &c.

The several very dissimilar forms constituting the life-cycle of *Thielavia basicola*, Zopf, has led to much complication and synonymy.

The mycelium first produced as the result of infection, permeates the tissues and remains slender and colourless. As a rule the host shows decided signs of injury, or is killed outright before the fungus commences to produce its fruit on the surface of the injured portions. When this stage has been reached, if conditions are favourable, branches of the mycelium grow outwards and cover the surface of the diseased part with a plexus of mycelial branches, which soon give origin to the first or *Milowia* form of fruit, which consists of simple or branched, upright, septate branches, becoming gradually narrowed upwards and remaining perfectly colourless. In due course the apical portion of each erect branch becomes ruptured, and the contents grow out through the torn apex as a chain of spores which readily separate from each other, and germinate at once (Figs. 3 and 4). This form of fruit is very ephemeral and is rarely seen in the field, although in pure cultures it forms a snow-white, mould-like stratum. It alone is responsible for the spread of the fungus in the form of an epidemic during the early stage of growth of the host-plant, but it does not appear to be capable of infecting the root of a mature plant. The spores retain their power of germination for a very limited period of time, not more than one month so far as my experience goes. I first met with this stage of *Thielavia* forming a delicate white mould at the base of a dying plant of *Blysmus compressus*, and at the time considered it as an entity and worthy of generic rank, and published it as *Milowia nivea*. Saccardo afterwards placed *Milowia* as the type of a new tribe of the *Hyphomycetes* which he established under the name of *Milowieae*. The spores or conidia are somewhat variable in size, thin-walled, cylindrical with truncate ends, and average 15–25 × 4–6μ.

As the *Milowia* stage of fruit disappears, the mycelium developed externally on the host, becomes tinged brown, and gives origin to a second or *Torula* form of fruit. In fact the *Milowia* and *Torula* stages may sometimes be met with on the same branch of mycelium (Fig. 5); in such instances the *Torula* or second phase of the fungus always occupies the youngest or apical portion of the mycelial branch. The *Torula* spores are comparatively quite large, clavate and multiseptate, at first thin-walled and colourless, but gradually changing to a dark brown and eventually becoming quite opaque. The cell-walls also increase considerably in thickness during the growth of the spore. When the spores are mature they break up into their component cells, which resemble discs of varying thickness and are circular or more or less obtusely polygonal in

outline. These detached cells or chlamydospores cannot be induced to germinate at the moment of maturity, but do so readily after remaining in a passive condition for some months. This phase of the fungus is usually the only one observed, unless special watch is kept, being rendered conspicuous by the copious production of spores, which often form black, crust-like patches on the diseased root and collar of the host-plant. The spores vary considerably in size, and may be straight or curved, average size 40–65 × 12–20μ at the widest part near the apex. This stage of *Thielavia* was first observed, in 1850, by Berkeley and Broome, who considered it as a member of the genus *Torula*, and described it as *T. basicola*. It was found at the base of stems of peas, and of *Nemophila*. Respecting its propensities, the authors wrote as follows. "It is either destructive of the plant on which it grows, or is developed on it in consequence of previous disease." From an economic standpoint, this is the most dangerous phase of the fungus, as the resting spores enable the parasite to tide over that portion of the year when its host-plants, which are mostly annuals, are not in active growth. These resting spores germinate readily on dung and produce the *Milowia* and *Torula* forms of fruit on this matrix, in fact the fungus appears invariably to commence life as a saprophyte, and when conditions are favourable, as expressed by the presence of rootlets of seedlings, it assumes a parasitic habit; otherwise it can pass through all the phases of its life-cycle as a saprophyte. In fact the fungus at best is but a very imperfect parasite, the vegetative mycelium first resulting from the germination of the spores being alone parasitic, but its action is sufficient to cripple if not completely to kill the host. The various forms of fruit are then produced externally on the host, which it has previously killed. I have repeatedly observed the *Torula* follow the *Milowia* stage, when the fungus was growing on pea seedlings infected with diseased portions of plants killed by the fungus, and have also observed the same sequence when a pure culture of *Milowia* spores was used.

The third and highest or ascigerous form of fruit was first described by Zopf in 1876. This author also observed the *Milowia* and *Torula* stages of the fungus, and connected the two with his recently discovered ascigerous stage, to which he gave the name of *Thielavia*. The perithecium is minute, subglobose, blackish, glabrous, without a stoma or aperture, 80–120μ in diameter (Fig. 7). Asci numerous, broadly ovate, 8-spored (Fig. 8). Spores cylindrical, with rounded ends, and often slightly curved, or approaching to lemon-shaped, 1-celled, smooth, more or less lenticular or laterally compressed, coloured, 10–12 × 5–6μ (Fig. 9). This is undoubtedly the least known stage of *Thielavia*, due to the fact that it is only produced on dead, dry and more or less disintegrated portions of the host-plant. Up to the present, it has not occurred in artificial cultures.

Affinities.

Zopf, Winter and Saccardo consider that *Thielavia*, should be placed in the *Perisporiaceae*, Sub. Fam. *Perisporiae*, next the genus *Orbicula*. This I also consider to be its natural position. Fischer, on the other hand, places *Thielavia* in the family *Aspergillaceae*, and

considers it as most closely allied to the common blue moulds included in the genera *Aspergillus* and *Penicillium*.

The synonymy is as follows :—

Thielavia basicola, *Zopf*, Sitz. Bot. Ver. Prov. Brand. 18, p. 101 (1876) ; *Torula basicola*, B. and Br., Ann. Nat. Hist. ser. 2, 5, p. 461 (1850) ; *Helminthosporium fragile*, Sor., Hedw. 15, p. 113 (1876) ; *Milowia nivea*, Mass., Journ. Roy. Micr. Soc. 4, p. 841 (1884) ; *Clasterosporium fragile*, Sacc., Syll. Fung. 4, p. 386 (1886).

Distribution.

The fungus was first observed by Berkeley in England in 1850. It has also been recorded from France, Germany, Italy, Russia, the United States and Cuba. It has proved to be very destructive to cultivated crops in Italy, Germany and the United States, and is probably much more widely distributed in the soil than is generally suspected.

Now that a simple and certain method for determining its presence has been discovered we are in a position to anticipate it and to act accordingly, as the means necessary for its arrest are practical, inexpensive and effective.

In England its distribution is certainly widespread ; seedling asters and sweet peas, more especially, have been received at Kew in large quantities from practically every part of the country ; many weeds also suffer from its presence. Excluding trees and woody plants, the fungus appears to be practically omnivorous.

It has been recorded as parasitic on plants belonging to the following genera : *Apium* ; *Aralia* ; *Aster* ; *Begonia* ; *Beta* ; *Blysmus* ; *Cochlearia* ; *Cyclamen* ; *Daucus* ; *Lathyrus* ; *Lupinus* ; *Cypripedium* ; *Nemophila* ; *Nicotiana* ; *Onobrychis* ; *Pisum* ; *Scorzonera* ; *Senecio* ; *Trigonella* ; *Viola*. In some instances the injury caused by this fungus assumes serious proportions and the tobacco crop, both in Europe and in the United States, has suffered to the greatest extent. In this country the disease has assumed the proportions of an epidemic in the case of asters and peas, in fact during the past few years it has become practically impossible in certain districts to grow asters, the seedlings being destroyed wholesale. Sweet peas also suffer to a very serious extent in many places, and culinary peas to a less extent.

Cultures of the Fungus.

The conidia of the summer stage (*Milowia*) germinate freely within twenty-four hours in water. As a rule only one germ-tube is produced from one end of the conidium. In those instances where two germ-tubes are produced one from each end of a conidium, one of the germ-tubes continues to grow vigorously, the other remaining small and stunted, and eventually dying. The conidia only retain their vitality for about ten days, and no conidium was observed to germinate after it had been liberated for more than a fortnight. Germination is most vigorous immediately after the conidia are liberated, and the percentage of germination decreases daily with the increasing age of the conidia. As compared with a neutral medium, the presence of a slight amount of acidity in the nutrient solution favours germination and the development of

mycelium, whereas, on the other hand, a trace of akalinity in the nutritive medium retards germination and subsequent growth of the mycelium. The conidia also germinate freely on moist stable manure, covering the surface within a week with the snow-white tufts of the *Milowia* stage of the fungus, which is followed by the black masses of conidia forming the *Torula* stage. The ascigerous condition was not observed. The fact that the fungus can produce its two conidial phases as a pure saprophyte is a point of great importance from an economic standpoint, and suggests the importance of burning all diseased plants, lest they should by any chance find their way to the manure heap, from whence the conidia of the *Torula* stage of the fungus would eventually be returned to the land in a condition favourable for germination. By such means the widespread occurrence of the fungus may probably be explained.

The chlamydospores resulting from the breaking up of the *Torula* form of fruit do not germinate until after a period of rest, and serve to tide the fungus over that period when living host-plants are not forthcoming.

Chlamydospores obtained from aster seedlings that had been dried for a year germinated in a very dilute solution of stable manure, at the end of four days, and another batch of chlamydospores obtained from the same source, germinated on sterilised stable manure, and produced the *Milowia* form within a week, followed by the *Torula* form. Experiments prove that the *Milowia* conidial form constantly reproduces itself ; this takes place so long as climatic conditions are favourable for its development, and the distribution of the fungus in space depends entirely on its *Milowia* conidial phase.

A batch of orchids (*Cypripedium*) attacked by *Thielavia*, was sent to Kew for investigation. The basal portion of each plant was soft and decayed, and covered on the surface with a dense, black, crusty layer consisting of the *Torula* condition of the fungus. When placed in a damp chamber at the ordinary temperature of the laboratory, the white *Milowia* stage of the fungus developed within a few days, and gradually encroached on the still living green portion of the leaves. This material, available in quantity for the first time, enabled a series of experiments to be made on the action of the fungus on germinating seeds and on seedlings.

Twelve "marrow fat" peas were planted in each of two Petri dishes, in soil sterilised by steam and afterwards mixed with a copious growth of the *Milowia* form of the *Thielavia*. A third Petri dish used as a control, was prepared in a similar manner, excepting that no fungus was mixed with the soil. After a period of ten days five seedlings appeared above ground in one of the infected dishes and three seedlings in the other. All these seedlings however died within a few days. On examining the peas that had not appeared above ground, it was found that both plumule and radicle had in every instance been killed by the fungus, as was also the case with those that appeared above ground at a later stage. All the peas in the control dish germinated and produced healthy seedlings. No success attended the many attempts to infect the leaves or above-ground portion of the stem of peas with the *Milowia* stage of the fungus. Seedlings of the Shepherd's purse (*Capsella*

Bursa-pastoris), were also killed by the fungus. On the other hand germinating oats were not attacked, neither were those of another grass, *Briza maxima*. Four Petri dishes containing ordinary garden soil, sterilised by steam and afterwards infected with *Thielavia* in the *Milowia* stage, obtained from a pure culture on manure, were prepared. Two of these were flooded with one per cent. of formalin in water for an hour, after which the liquid was poured off and the soil allowed to remain for a week, when all trace of the smell of formalin had disappeared. The soil in the two remaining dishes was left untreated. Twelve peas were placed in each dish. At the expiration of ten days, all the peas in the two dishes treated with formalin were making vigorous growth, whereas in one of the dishes not treated with formalin, no growth appeared above the surface of the soil, and in the second untreated dish four sickly seedlings continued to grow for a few days, but finally collapsed with one exception. When peas germinate in pure sand, mixed with the *Milowia* stage of the fungus attached to fragments of manure, infection of the seedlings occurs, whereas when spores of the *Milowia* stage of the fungus alone are mixed with the sand, no infection takes place. This, along with experiments already recorded, proves that the germinating spores of the fungus cannot infect a host-plant directly, but only after the mycelium has existed for some time as a saprophyte, on humus or decaying vegetable matter.

Symptoms of the Disease in Sweet Peas.

In those instances where the land is badly infected, the majority of the peas do not appear above ground at all. This occurs when both the plumule and radicle are attacked. In such cases if a number of the peas are dug up and placed with sterilised manure in a Petri dish, the contents kept moist and at a temperature of about 65° F., the white *Milowia* condition of the fungus will appear on the surface of the manure within a few days. In the majority of cases the root only is attacked, at least at first, and the plant often attains a considerable growth before any sign of injury appears, but suddenly the plant may begin to wilt, turn yellow, and die, or in some instances only one branch dies, the rest of the plant remaining green for some time, but rarely producing perfect fruit. Another very common symptom of the disease is known to growers of sweet peas under the name of "streak" or "stripe," characterised by the presence of dingy yellow streaks or stripes on the leaves and stem. This condition is the result of what may be termed a mild attack, the fungus not being present in the tissues of the root and collar in sufficient quantity to kill the plant outright, yet sufficiently abundant to prevent the root from performing its function to the fullest extent, hence the stem and leaves lack water and are hungered. The green portions of a plant showing "streak" correspond to the position occupied by the vascular bundles or water-conveying vessels where the limited supply of water obtained by the root makes itself evident, whereas the yellow portions between the veins are dead, owing to lack of water. If the root of a pea plant that has been attacked by the fungus is examined, it will be seen to present a blackened or charred appearance, and very frequently to

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be more or less decayed on one side, suggesting the idea that it had been gnawed by wireworm. In some cases small black patches of the *Torula* form of fruit are present on the surface.

Symptoms of the Disease in Asters.

So far as my experience goes, asters are always killed outright during the seedling stage. When the plants are about three inches high they commence to wilt, and soon fall over as in the disease known as "damping off." The roots of diseased plants are shrivelled and blackened, and all the rootlets are dead. The fungus appears to spread very rapidly in the soil, as whole batches of seedlings collapse simultaneously.

Symptoms of the Disease in Orchids.

I have only observed the disease on cultivated species of *Cypripedium*, of which abundant material was sent to Kew, and it was stated to be present on most of the plants occupying a large house. The roots are attacked first, then the bases of the leaves, which gradually become brown and finally assume the condition of a soft rot, when the whole plant falls over. The snow-white *Milowia* fruit was produced in abundance when the decayed portions were placed under favourable conditions for its growth. It was in all probability the spores of this condition of the fungus that spread the disease from one plant to another in the house, the minute spores being dispersed by wind, syringing, &c.

Preventive Measures.

It is practically impossible to cure a plant that is once infected, as the mycelium is located in the living tissues of the root, and no substance is known that will check or kill such mycelium, without at the same time killing or materially injuring the host-plant. Hence the only means of checking the onslaught of the fungus is by the adoption of preventive measures. The great majority of the disease is obviously due to infected land. No evidence of the presence of spores on peas or other seeds is forthcoming, and would not be expected to occur, when it is remembered that the fungus, as a parasite, confines itself to the root and collar of the stem. Infection of the soil may be brought about by various means. When a diseased crop is grown, the roots in most instances become thoroughly decayed, and too friable to remove even if an attempt was made to do so. It is on such decayed roots that the *Torula* or resting-spore stage of the fungus grows, consequently the soil becomes infected, and even if a crop of some kind is afterwards grown that the fungus cannot attack, it finds host-plants in the various kinds of weeds growing along with the crop. In addition, when it is remembered that the fungus can pass through its complete course of development as a pure saprophyte, feeding on the humus present in the soil, it will be readily understood that when land is once infected, the fungus is quite capable of holding its ground, and of quickly extending its area of devastation, unless prompt measures are taken. The infection of a new area is in the majority of instances due to the use of manure, on which material the fungus flourishes and reproduces itself at a rapid rate.

Commercial formalin (= 40 per cent. formaldehyde), has proved to be the most effective fungicide for sterilising infected soil. In the United States, where *Thielavia* proves very destructive in causing a root-rot of tobacco seedlings, the soil of the seed-beds is thoroughly soaked with a solution of formalin in water, in the proportion of one pint of formalin to twelve gallons of water. One gallon of the mixture should be allowed for each square foot of surface. After the watering is completed the soil should be covered for two or three days with coarse sacking or canvas, to keep in the fumes. The watering should be done after all digging has been done and when the seed beds are in a condition ready for sowing, and a week or ten days should intervene between the soaking of the soil and the sowing of seed, to allow for the complete escape of the formalin fumes and the drying of the soil.

When green manure is dug into land intended for seed beds it should previously be thoroughly watered with formalin as above.

Professor Benincasa has quite recently conducted a series of experiments, as to the best means of checking root-rot of tobacco in seed-beds. Having proved that infected soil is the usual source of injury, and that heating such soil to a temperature of 90° C. does not completely eradicate the disease, comparative tests were made by using ordinary garden soil, pure sand, and volcanic ash or pumice for seed-beds. The plants grown in garden soil were badly infected, seed-beds of sand proved very efficient in controlling the disease, volcanic ash gave the best results of all, both in arresting the disease, and in the rapid and vigorous growth of the seedlings. This result is partly due to the absence of humus, which favours the continuous growth of the fungus in soil containing organic matter, and also to the physical conditions of such soil.

The author suggests the use of coal ashes, volcanic scoria, or naturally or artificially powdered volcanic rocks, as suitable for the formation of seed-beds.

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Explanation of Plate.

Figs. 1 and 2 nat. size, the remainder highly magnified.

Fig. 1. Root of Sweet Pea injured by the fungus.
„ 2. Root of *Cypripedium* injured by the fungus.
„ 3. Conidial (*Milowia*) stage.
„ 4. Free conidia, some germinating.
„ 5. Resting-spore (*Torula*) stage.
„ 6. Free resting-spores.
„ 7. Perithecium of ascigerous stage.
„ 8. Ascus containing eight spores.
„ 9. Free ascospores.

IV.—AFRICAN BUXEAE.

J. Hutchinson.

Baillon, in his careful monograph of the *Buxaceae*, published in 1859, regarded them as a separate order and divided the genus *Buxus* containing 13 species into two sections: (i.) *Eubuxus* and (ii.) *Tricera*. These sections besides occupying separate geographical areas are distinguished on account of differences in the form of the inflorescence. In both of them the anthers are supported by well-developed filaments and in the male flowers a large rudimentary ovary is present. At the time of Baillon's monograph no species was known to occur on the African continent, but he recorded and described one from Madagascar (*B. madagascarica*) without, however, having seen male flowers.

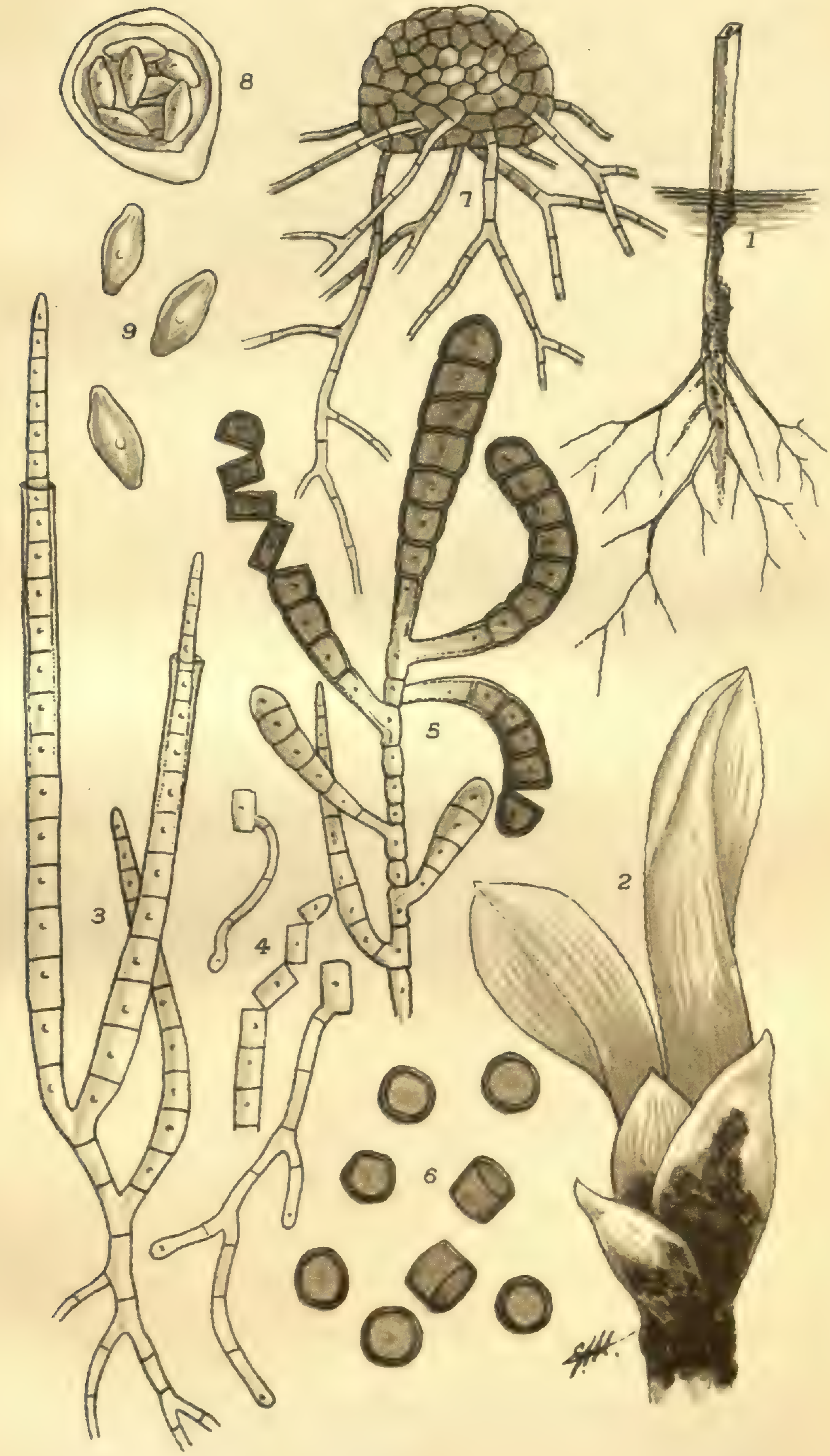
Müller in 1869 (DC. Prodr. xvi. i. 13–20) adopted Baillon's arrangement, adding 5 other species.

Baillon in 1873 (Adansonia xi. 268) described *B. Hildebrandtii*, and named it after the collector who found it in the mountains of Somaliland. He pointed out its close affinity with the other Old World species.

Oliver in 1882 (Hook. Ic. Pl. t. 1400) described and figured the genus *Notobuxus*, from Natal, which differs from *Buxus* in having two additional stamens, sessile anthers, and by the absence of a rudimentary ovary from the male flowers.

The same author four years later (l.c. t. 1518) figured and described *Buxus Macowani*, from British Kaffraria, and at the same time pointed out that it differed from *Buxus*, as previously known, by its sessile anthers and by the suppression of the rudimentary ovary in the male flowers.

Gilg in 1899 (Engl. Jahrb. xxviii. 114), described a new genus, *Macropodandra*, from specimens collected by Stuhlmann in the forests at Wabadso on the Uganda border of the Belgian Congo, but I am unable to distinguish this genus from *Notobuxus*, Oliv., and can only regard it as a distinct species. The same author (l.c. 115) recorded a new species of *Buxus* (*B. benguellensis*) from Angola which is very closely allied to *B. Macowani*, Oliv. from South Africa and the examination of male flowers, all collected by Mr. Gossweiler, proves that both species have the same floral structure.



A root disease of Sweet-peas, Asters, &c.

[*To face page* 52.

809 118/9 1125 12 11.

Malby&Sons.Lith.

Van Tieghem in 1897 (Ann. Sci. Nat. Sér. viii., v. 289), gave a general review of the whole group, and divides *Buxus* into four genera which are chiefly distinguished by differences in anatomical structure. *Buxus* he restricts to the extra-African Old World species; *Buxanthus* he establishes on *Buxus Hildebrandtii*, Baill., and on a Socotran plant which he rightly separates from that species and names *Buxanthus pedicellatus*; *Buxella* includes Baillon's Mascarene species and *Buxus Macowani*, Oliv.; *Notobuxus*, Oliv. is retained and finally the West Indian section *Tricera* is restored to generic rank.

Pax in 1900 (Engl. and Prantl, Pflanzenfam. Nachtr., ii., 38), reduced Van Tieghem's two new genera to *Buxus*, § *Eubuxus*. This in part is also the writer's opinion with the exception that *Buxella* is considered to be a section distinct from *Eubuxus*. Whether *Buxella* should be treated as a section or as a distinct genus is not of great moment, but it should include *Buxus benguellensis*, Gilg, and a new species from Nyasaland described below as *B. nyasica*.

The species included under *Buxella* differ from the remaining species of *Buxus* by having sessile anthers and by the absence of a rudimentary ovary, and further they are confined to the Southern Hemisphere where no other Box trees occur. They constitute a group which is practically intermediate and apparently forms a connecting link between *Buxus* and *Notobuxus*.

Buxus.

§ **Eubuxus**. Anthers supported by filaments; rudimentary ovary present in the male flowers.

Inflorescence sessile or subsessile; male flowers sessile or nearly so; sepals ovate, woolly-ciliate; female sepals shortly pointed, coriaceous, woolly-ciliate.

1. *B. Hildebrandtii.*

Inflorescence pedunculate; male flowers shortly pedicellate; sepals lanceolate, shortly and sparingly ciliolate; female sepals truncate, submembranous, not ciliate.

2. *B. pedicellata.*

§ **Buxella**, sect. nov. (genus, Van Tieghem). Anthers sessile; rudimentary ovary absent from the male flowers.

Leaves rhomboid-obovate or oblanceolate, rounded or emarginate at the apex, less than 2·5 cm. long.

Nerves distinct on the upper surface.

3. *B. benguellensis.*

Nerves not or scarcely visible on the upper surface.

4. *B. Macowani.*

Leaves ovate or lanceolate, acuminate or acute, rarely obtuse, more than 3 cm. long.

Leaves ovate or ovate-oblong, sometimes subcordate, acute or obtuse. 5. *B. madagascarica.*

Leaves lanceolate, long and gradually acuminate.

6. *B. nyasica.*

1. **B. Hildebrandtii**, Baill. Adansonia vol. xi. p. 268.
B. calophylla, Pax in Engl. Jahrb. xxxix. 632.

Buxanthus Hildebrandtii, Van Tieghem in Ann. Sci. Nat. Sér. VIII. v. 326.

TROPICAL AFRICA. Harar: Diredana, *Rosen !* Somaliland: Ahl Mountains, Maid, 800–2000 m., *Hildebrandt*, 1547 ! 891 ! Golis Range, *Mrs. E. Lort Phillips ! Drake-Brockman*, 289 !

Mrs. Lort Phillips states that this species occurs all over the Golis Range, attaining a considerable height in places where the undergrowth is thick and otherwise bushy.

Pax (l.c.) was evidently under the impression that Baillon's type came from Socotra.

2. **B. pedicellata**, *Hutchinson* (comb. nov.).

Buxanthus pedicellatus, Van Tieghem in Ann. Sci. Nat. Sér. VIII. v. 320.

Buxus Hildebrandtii, Balfour, Bot. Soc. 269, *non* Baill.

As Van Tieghem's description is in note form I take the present opportunity of drawing one up from the complete material at Kew.

Frutex 3 m. altus; rami subteretes vel angulares, glabri vel minute puberuli. *Folia* oblanceolata, rotundato-obovata vel suborbicularia, apice rotundata vel leviter retusa, basi attenuata vel cuneata, 2–4 cm. longa, 0·5–2·5 cm. lata, integra, rigide coriacea, supra subnitida, subtus pallida, utrinque glabra, nervis lateralibus utrinque 4–6 plerumque indistinctis. *Inflorescentia* e cymulis 3 vel 4 constituta, axillaris, pedunculata; cymulae 3–5-florae, flore terminali ♀ vel omnes ♂; pedunculi ad 7 mm. longi, angulares, glabri; bracteae lanceolatae, subacutae, 2–3 mm. longae, inferne breviter ciliolatae; ♂ pedicelli ad 2 mm. longi, angulares. *Flores* ♂. *Sepala* lanceolata, vel ovato-lanceolata, subacuta, 2 mm. longa, 1–1·5 mm. lata, margine membranacea, breviter ciliolata. *Stamina* 4; filamenta carnosa, 2·5–3 mm. longa; antherae ovatae, obtusae, 1·5 mm. longae. *Ovarii rudimentum* globosum, verrucosum, 1·25 mm. diametro, glabrum. *Flores* ♀. *Sepala* truncata, membranacea, eciliata. *Ovarium* glabrum; styli crassi, recurvi, circiter 3 mm. longi. *Capsula* 1–1·2 cm. longa, tricornuta. *Semina* 7 mm. longa, nitida, brunnea.

SOCOTRA. *Balfour*, 637 ! *Schweinfurth* 415 ! *Bent ! Hunter*.

Balfour states that this tree is very abundant in the island; the wood is extremely hard.

3. **B. benguellensis**, *Gilg* in Engl. Bot. Jahrb. xxviii. 115.

TROPICAL AFRICA. Angola: Huilla, *Antunes*, A. 46 ! 248 !

Var. **hirta**, *Hutchinson*, var. nov.; a typo ramulis et foliis subtus breviter pubescentibus recedit.

ANGOLA: 10 miles north of the river Lifuni, *Gossweiler*, 4901 !

Mr. Gossweiler's plant appears to be a pubescent form of *B. benguellensis*, the type of which, thanks to the courtesy of Prof. Engler, I have had an opportunity of examining. Male flowers of this species have not hitherto been described, and as they were collected by Gossweiler, a description is given.

Flores ♂ solitarii, axillares, subsessiles, bracteis squamiformibus 3 vel 4 subtendentibus. *Sepala* 4, decussata, ovato-elliptica, obtusa, 1·5 mm. longa, 1–7·5 mm. lata, medio leviter coriacea, ad marginem membranacea, glabra. *Stamina* 4; antherae sessiles, 1·5 mm. longae, glabrae. *Ovarii rudimentum* nullum.

4. **B. Macowani,** *Oliv.* in Hook. Ic. Pl. t. 1518 ; Sim, Forest Fl. of Cape Colony, 321, pl. 145, fig. 1.

Buxella Macowani, Van Tieghem in Ann. Sci. Nat., Sér. VIII., v. 326.

SOUTH AFRICA. East London : in primitive woods near Kwelegha, *Hutchins in Herb. Macowan*, 916 ! in the "Park," *Flanagan*, 1727 !

5. **B. madagascarica,** *Baill.* Monogr. Buxac. 65 ; Muell.-Arg. in DC. Prodr. xvi. i. 18.

Buxella madagascarica, Van Tieghem in Ann. Sci. Nat., Sér. VIII., v. 326.

MADAGASCAR. *Du Petit Thouars.* An example of this species has not been seen.

6. **B. nyasica,** *Hutchinson*, sp. nov. ; species foliis lanceolatis vel subovato-lanceolatis longe acuminatis, antheris sessilibus, floribus ♂ ovarii rudimento nullo valde distincta.

Frutex vel *arbor* ; rami subteretes, leviter sulcati, glabri ; ramuli juniores paullo complanati, glabri. *Folia* lanceolata vel subovato-lanceolata, apice acuta, sensim longe acuminata, basi cuneata, 4·5–6·5 cm. longa, 1·2–2·2 cm. lata, integra, tenuiter coriacea, supra leviter nitida, subtus opaca, utrinque glabra, nervis lateralibus utrinque 15, e costa media sub angulo 45° divergentibus intra marginem arcuatis nervo marginale composita margine 2 mm. distante utrinque conspicuis ; petioli breves vel subnulli. *Flores* in axillis infimis plerumque ♂ et ♀ solummodo sed nonnunquam duo ♀ , pedicelli 2·5 mm. longi, bracteis imbricatis triangularis obtecti. *Flores* ♂. *Sepala* 4, late ovato-triangularia, dorso paullo carinata, circiter 1 mm. longa, glabra, margine membranacea. *Stamina* 4 ; antherae sessiles, acutae, vix 5 mm. longae, dorso 1 mm. latae. *Ovarii rudimentum* nullum. *Flores* ♀. *Sepala* maris. *Ovarium* glabrum ; styli 3, patuli, minute bifidi, intus sulcati et stigmatosi, 3·5 mm. longi, glabri. *Capsula* et semina non visa.

TROPICAL AFRICA. Nyasaland : Shiré Highlands ; Milanji, *Scott Elliot*, 8603 ! (typus in Herb. Berol.).

NOTOBUXUS.

Leaves obtuse or emarginate, not acuminate ; male flowers sessile or subsessile. 1. *N. natalensis.*

Leaves acutely acuminate; male flowers pedicellate. 2. *N. acuminata.*

1. **N. natalensis,** *Oliv.* in Hook. Ic. Pl. t. 1400 ; Sim, Forest Fl. of Cape Colony, 320, pl. 145, fig. 2.

SOUTH AFRICA. Natal : Inanda, *Wood*, 374 ! 1357 ! Durban, *Schlechter*, 2797 ! Tongaat, *Cooper* ! Pondoland : Port St. John, in forest at West Gate, *Galpin*, 3471 ! Egossa, *Sim*, 2424 ! 2427 ! Transkei : Kentani ; Manubi forest, common shrub 4–6 ft., *Pegler*. 1258 !

2. **N. acuminata,** *Hutchinson* (comb. nov.).

Macropodandra acuminata, Gilg in Engl. Bot. Jahrb. xxviii. 114.

TROPICAL AFRICA. Belgian Congo ; Wabadso, in forests, *Stuhlmann*, 2647 !

V.—MISCELLANEOUS NOTES.

MR. R. GILL.—We learn that Mr. R. Gill, whose appointment as a Curator in the Agricultural Department of Southern Nigeria was recorded in *K.B.* 1909, p. 315, has been appointed an Assistant Superintendent of Agriculture in that Department.

J. S. SLATER.—John Samuel Slater was the third son of the late Rev. Samuel Slater, D.D., Rector of Stenigot, Lincoln, and some time Headmaster of Bishop Cotton School, Simla. He was born in Calcutta in 1850, educated at Pocklington Grammar School, Yorkshire, and Bishop Cotton School, Simla. He graduated in 1870 at the Thomason Civil Engineering College, Rurki, obtaining the Gold Medal for Mathematics. The same year he was appointed to the Public Works Department of the Government of India and served at Dera Ghazi Khan and other places in the Punjab.

In 1875 he was appointed Professor of Engineering at the Presidency College, Calcutta, and when the Engineering Department of that College was formed into an independent residential Engineering College at Sibpur he took a leading part in its organisation, became one of the original members of its staff and was eventually appointed Principal in 1891.

He inaugurated a scheme of modern education for the District Schools of Bengal and Assam and was responsible for the reorganisation of the technical schools of those two Provinces. In 1897 he was appointed Inspector of Schools of the Rajshahi Division and in 1901 officiated as head of the Educational Department of Bengal; in 1904 he was incapacitated by a serious illness which necessitated his retirement from India in that year.

Slater was responsible for teaching Astronomy to the students of the Engineering College and was always keenly interested in that science. In 1891 while on leave he devised and patented an armillary sphere which has proved of great value for instructional purposes. He was elected a Fellow of the Royal Astronomical Society in 1892.

After his retirement Slater devoted himself enthusiastically to an investigation of the pollen of plants and prepared by micro-photography a large number of enlarged photographs of pollen grains. In accordance with a wish which the deceased had expressed, the whole of his specimens and photographs were presented by his executors to the Royal Botanic Gardens, Kew.

He married in 1873 Jessie Frances, only daughter of Surgeon-Major John Bean, attached to the Royal Irish Fusiliers, by whom he had a son, deceased, and a daughter who is married to Mr. B. Heaton, the present Principal of the Sibpur Engineering College.

He died at Ealing on 7th April, 1911, aged 61.

B. H.

W. DON.—We learn with regret, through the Colonial Office, of the death of Mr. William Don, Curator in the Agricultural Department of Southern Nigeria, on December 10th, 1911. Mr. Don

was educated and brought up in Lady Breadalbane's Orphanage at Kenmore, and served his apprenticeship in Taymouth Gardens. He came to Kew from Whittinghame in 1902, and in the following year was appointed Assistant Curator to take charge of the new Botanic sub-station at Tarkwa, in the western part of the Gold Coast Colony (*K.B.* 1903, p. 31). Two years later he was transferred to the service of the Government of Southern Nigeria and was placed in charge of the Botanic Gardens at Old Calabar (*K.B.* 1905, p. 61). Mr. Don visited Kew in accordance with custom during his leaves of absence from the Colony, and in the spring of 1910 was permitted by the Secretary of State for the Colonies to visit the Colonial Museums at Hamburg and Haarlem. He had returned to England again on leave at the end of September and had intended taking a course of Entomology at the London School of Tropical Medicine. He died very suddenly of acute pneumonia at Taymouth Castle, Aberfeldy, Perthshire, in his 33rd year.

West Indian Agricultural Conference, 1912.—An invitation was received at the end of October from the Commissioner of Agriculture, West Indies, for a representative of the Royal Botanic Gardens, Kew, to attend the West Indian Agricultural Conference to be held at Trinidad from January 23rd—30th, 1912. With the sanction of the President of the Board of Agriculture and Fisheries, this invitation has been accepted, and the Assistant Director has been deputed to attend the conference as the representative of Kew.

Visitors during 1911.—3,704,606 visitors to the Royal Botanic Gardens have been recorded during the year 1911. These figures show an increase of 158,304 over those of the previous year and are the largest on record. During the ten years 1901–10, 22,459,027 persons have visited the gardens giving an average of 2,245,902. The total number of visitors on Sundays, during 1911, was 1,517,650 and on weekdays 2,186,956.

The largely increased number of visitors during the past year must be attributed mainly to the remarkable spell of brilliant summer weather and also to the large number of visitors to London in connection with the Coronation. As in 1910, there have been five Bank Holidays and the attendances on Easter Monday, Whit-Monday and the August Bank Holiday were 144,084, 157,425 and 115,833 respectively. The total number of visitors for the five holidays was 446,644, as against 424,010 in 1910.

Sunday visitors have decreased by 96,435, while the number of visitors on week days show an increase of 254,739.

The greatest attendance on any one day was, as has commonly been found to be the case, on Whit-Monday, when there were 4,971 more visitors recorded than for the corresponding day in the previous year which previously held the record for a single day.

The smallest number on any one day was 179 on December 20th.

The largest Sunday attendance was 88,005 on June 4th, and the smallest 423. The former figures show a decrease of about 3,000 from those recorded last year.

The detailed monthly returns are given below.

January	55,328
February	131,674
March	158,075
April	288,239
May	468,014
June	687,302
July	737,946
August	530,859
September	373,294
October	173,250
November	63,658
December	36,967
	3,704,606

Additions to Gardens, 1911.—Additions to the collections of plants cultivated at the Royal Botanic Gardens, Kew, have been made during the year by exchanges with other gardens, private as well as public, and by purchase from nurserymen and others. Contributions of plants and seeds received from Botanic Gardens and other institutions include the following :—

British Guiana. Plants brought over for the Rubber Exhibition.

Calcutta. Tubers of *Arisaema* ; collections of seeds from the Himalayas.

Darjeeling. Orchids.

Dunedin. Collections of plants and seeds.

Laeken. Tropical plants.

Manila. Collection of seeds.

New York. Succulent plants.

Singapore. Two Wardian cases of ferns ; seeds.

Sydney. Collection of seeds.

United States Department of Agriculture. Plants and seeds.

Exchanges were made with the Botanic Gardens of Edinburgh, Glasnevin, Cambridge and Oxford, and with most of the European gardens upon whom Kew is largely dependent for seeds of those annual herbaceous plants which fail to produce seeds at Kew.

Mr. W. Fox gave plants and seeds collected by him in the Amazon region. Mr. J. Gossweiler sent seeds from Angola. Dr. M. Grabham, Madeira, presented a quantity of *Orchis foliosa*. Dr. Schönland, the Albany Museum, Grahamstown, presented Euphorbias. Lady Hanbury, Ventimiglia, sent succulents, and a collection of seeds. Mr. J. C. Harvey, Mexico, presented plants and seeds. Dr. Kerr, Siam, gave plants and seeds. The Imperial Institute presented stems of *Castilloa lactiflua*. Lord Li Ching-fong (late Chinese Minister in London) sent Nelumbiums from China. Mr. C. J. Lucas, Warnham Court, sent Sobralias, Epidendrums, and other plants. Miss M. H. Mason, Cape

Colony, presented a collection of seeds. The Natural History Museum, South Kensington, gave Musas from the Canary Islands. Prof. H. H. W. Pearson, Cape Town, presented collections of succulents obtained by the Percy Sladen Expedition, seeds collected in Angola by Dr. McClelland Harrison, and *Freesia* corms. Seeds of *Welwitschia* were received from the Botanic Gardens, Groningen. Dr. Perez, Tenerife, sent seeds of *Juniperus Cedrus*, *Cytisus proliferus* var. *Canariae*, *Echium Pininana* and other interesting Canary Islands plants. Several presentations were made by exhibitors at the Rubber Exhibition held in London in July. Mr. H. Simpson gave a very fine specimen of *Platycerium alcicorne*. The United States National Museum presented succulents. Mrs. Vallentin, Falmouth, gave a collection of seeds from the Falkland Islands.

Among the seeds and plants of interest distributed from Kew during the year were the following :—Chinese *Meconopsis* (seeds), *Cuscuta* sp., Chile (seeds), *Cytisus proliferus* var. *Canariae* (seeds), *Eucommia ulmoides*, *Pinus patula*, *Rhamnus Purshiana* (seeds), *Quercus Ilex* (seeds to British Colonies), *Zizania aquatica*, and new Chinese Rhododendrons.

Two Wardian cases of plants were sent to Zanzibar, three to British East Africa, and one to British Guiana. Surplus trees and shrubs and herbaceous plants were presented to public institutions, and surplus *Nymphaea* tubers to public gardens; collections of plants were sent to Brussels Botanic Garden, University College, Cork, &c., &c.

Hardy Trees and Shrubs.—As has been the case for several seasons past, the most notable additions in this department during 1911 have been natives of China. The exploitation of the flora of Central and Western China which gave to the first decade of the twentieth century its most marked characteristic so far as horticulture is concerned, was carried on during the early part of the year by Mr. E. H. Wilson, who brought his fourth journey to a successful conclusion in the spring. Kew, in conjunction with H.M. Office of Woods and Forests, was a participator in the enterprise and received in all 381 packets of seeds as its share. Almost every one of these was labelled only with the generic name. Among the new species, those of Abies and Picea will probably arouse the most general interest. They represent some of the last new types of their kind probably the world will yield. The seeds germinated excellently, but unfortunately Kew will not be able to do the plants justice. Conifers as a whole are not well suited at Kew, and, of them all, Abies and Picea are the unhappiest. Fifty-four packets of Rhododendron were received, only one of which (No. 4234) failed. The other genera most strongly represented were Acer, Cotoneaster, Lonicera, Rosa, Spiraea and Viburnum. A Berberis (No. 1284) of Mr. Wilson's collecting during his previous journey flowered, and has since been named *B. Stapfiana* by Dr. Schneider.

Some interesting seeds collected by Mr. G. Forrest on the Lichiang mountains and presented by Mr. J. C. Williams and Mr. Bulley were alluded to in the *Kew Bulletin*, 1911, p. 203. To

Mr. Williams Kew is also much indebted for a fine example of *Enkianthus chinensis* about five feet high—one of the rarest of all shrubs in cultivation.

In March Mr. Maurice L. de Vilmorin sent a most interesting set of over forty miscellaneous trees and shrubs. *Corylus thibetica* and the interesting *Alnus cremastogyne* were amongst them. From Messrs. J. Veitch & Sons 36 Rhododendrons of Wilson's collecting were received. A new lilac previously obtained from the same firm flowered and has been named *Syringa Julianae* by Dr. Schneider. From Miss Willmott came a nice plant of *Cunninghamia sinensis*. This remarkable conifer, is, of course, an old one in gardens, but, as hitherto represented, it has only been a success in a few very favourably situated places. At Kew the trees are severely hit every hard frost. But Mr. Wilson believes that the newly introduced ones (of which Miss Willmott's is one) will prove hardier, as he collected the seeds in the coldest and most inclement parts of the habitat of this tree. The Earl of Annesley sent a good example of the new *Picea morindoides*, still very rare. Mr. Clinton-Baker presented a plant of *Fokienia Hodginsii*, a new genus of Coniferae, also seeds of the Formosan variety of *Cupressus obtusa* and of *Pinus Armandii* var. *Mastersiana*.

From the Arnold Arboretum several consignments of seeds and plants have been received. Amongst the latter some new Magnolias of Wilson's collecting are of especial importance. To a genus of such distinction as Magnolia every addition is particularly welcome. The development of several unnamed Chinese poplars, willows and beeches, sent by Professor Sargent, will be watched with interest. One of the poplars Mr. Wilson describes as even finer than *P. lasiocarpa*, which is itself certainly one of the most wonderful plants recently come out of China, *Salix magnifica*, with oval leaves like those of *Arbutus Menziesii* in shape and colour, but with the blade as much as $8\frac{1}{4}$ inches long by $5\frac{1}{4}$ broad, is another remarkable small tree quite different from any other known willow. In striking contrast with it is *Salix Bockii*, a dainty little shrub with leaves $\frac{1}{4}$ to $\frac{1}{2}$ inch long, and said by Wilson to be extremely pretty in flower. Both these have been received.

Of American trees Mr. F. R. S. Balfour sent seeds of *Rhamnus Purshiana* and acorns of *Quercus densiflora*, a handsome evergreen oak of the Pasania section, whose leaves are clothed with a tomentum milk-white in spring, tawny later. Of this oak only two trees are generally known in the British Isles, both in the collection at Kew. This and the fact that it is becoming scarce in a wild state make its re-introduction welcome. From Messrs. Fisher, Son & Sibray, of the Handsworth Nurseries, we have received among other things six fine American beeches (*Fagus ferruginea*) raised from seeds. The species has long been represented in the beech collection at Kew, but only by grafted trees. As the most striking characteristic of *F. ferruginea* is its habit of producing suckers like an elm, plants on their own roots are very desirable.

Kew has continued to draw on the rich collection of Canon Ellacombe at Bitton for plants which disappear in hard winters. *Aplopappus ericoides* and *Rosa Hardii*, among other things, were this year obtained from him. Mr. M. Phillips Price, of Tibberton

Court, Gloucester, sent unnamed seeds collected by himself in Mongolia during a recent exploring expedition. Some uncommon species and garden varieties of rhododendron were sent by Sir E. G. Loder, Bart., from his fine collection at Leonardslee.

Waterfowl.—During the past year several additions by presentation and exchange have been made to the collection of Waterfowl in the Royal Botanic Gardens. They include :—

1 pair of Fulvous tree-ducks ; 1 pair of Ruddy sheldrake ; 1 pair of Bahama ducks ; 1 pair of Versicolor teal, and a Scaup duck, presented by the Hon. N. C. Rothschild ; 1 pair of Muscovy ducks, presented by the Zoological Society of London ; 1 pair of Demoiselle cranes ; 1 pair of Chiloe widgeon and 1 pair of Brazilian teal, received in exchange from the Zoological Society of London.

The black-necked swans again went to nest but failed to hatch any young birds, and the storks hatched out two young birds as usual, but they were not reared owing to the old birds having been disturbed.

The greatest success was obtained with Carolina ducks, 24 young birds being reared. Three common sheldrake and one red-crested Pochard were also reared, as well as numerous Tufted duck.

Official Visits.—During the past year the vote for travelling expenses has been utilised as follows :—

The Director.—For the purpose of studying at the Herbarium of the Museum d'Histoire Naturelle, Paris.

The Curator.—On visits to the Royal Agricultural Show, Norwich, and to various horticultural establishments at Bruges.

The Assistant Curator.—To visit the Royal Botanic Gardens, Edinburgh.

The Keeper of the Herbarium.—For the purpose of studying the distribution of *Spartina* in the Isle of Wight.

Mr. Brown, Assistant Keeper in the Herbarium.—To study in the herbaria at Berlin and Lubeck.

Mr. Rolfe, Assistant in the Herbarium.—To study in the herbaria at Florence.

Mr. Cotton, Assistant in the Herbarium.—In connection with the Survey of Clare Island, Ireland, and also towards the investigation of the growth of *Colpomenia sinuosa* on the South Coast of England.

The Keeper of the Museums.—To visit the Royal Agricultural Show at Norwich ; to attend the meeting of the Museums Association at Brighton, and to visit Liverpool in connection with the importation of tropical products.

Mr. Dallimore, Assistant in Museums.—To attend the Bath and West and Southern Counties Agricultural Show at Cardiff, and to visit the Forest of Dean ; also to attend the Glasgow Exhibition, the Scottish Arboricultural Society's Excursion, and to visit various estates in Scotland in connection with British Forestry.

Museums.—During the past year considerable progress has been made in generally improving and re-labelling the permanent collections. The work of dealing with the products received from the Japan-British Exhibition was continued and completed, and in this connection it may be recorded that 5500 fully labelled duplicate specimens have been distributed to 50 institutions, including the following:—Avondale Forestry School, Rathdrum, co. Wicklow; Municipal Museum, Warrington; Natural History Museum and Art Gallery, Bristol; Museum, Botanic Gardens, Sydney, N.S.W.; University, Aberdeen; Royal College of Science, Dublin; Science and Art Museum, Dublin; South Eastern Agricultural College, Wye, Kent; University, Leeds; and to the Directors of Education, Glasgow, Liverpool, Cardiff, Birmingham, Hull, London, &c.

Many interesting products have been received from 137 contributors and placed in position in the collections, and those of special interest have been recorded from time to time in the Bulletin.

The Museum Staff has been fully occupied in determining vegetable economic products, and in giving general information on these matters to an increasing number of correspondents.

Collections were prepared from duplicate material, chiefly of subjects bearing upon Forestry, for the exhibit of the Board of Agriculture and Fisheries at the Shepherd's Bush Exhibition, for the Royal Scottish Exhibition, Glasgow, and for the Bath and West and Southern Counties Show, held at Cardiff.

Individual members of the Staff attended the above-mentioned Exhibitions and Shows, the Royal Show at Norwich, the Meeting of the Museums Association at Brighton, and the Annual Excursion of the Royal Scottish Arboricultural Society to the Border Country.

Presentations to Museums.—The following miscellaneous specimens have been received in addition to those previously recorded in the Bulletin:—

The Right Honourable the Earl of Plymouth, St. Fagan's Castle, Cardiff.—Diseased branches of Ash. Larch trunk infested with Aphis. Larch trunk injured by Honeysuckle and afterwards by Canker. Twenty-four photographs of subjects connected with Forestry.

The Right Honourable the Earl of Stanhope, Chevening, Sevenoaks.—Section of wood of *Corylus Avellana*.

Mr. M. P. Price, Tibberton Court, Gloucester.—Section of stem of Saxaul (*Haloxylon Ammodendron*). Used by Tartars as fuel and by Russians on the Central Asian Railway to prevent sand drifting.

The Right Honourable the Earl of Albemarle, Quidenham, Attleborough.—Board of Black Walnut.

Messrs. George Black and Sons, Berwick-on-Tweed.—Model of Creosoting Plant.

Dr. Tromp de Haas, Netherlands Section, International Rubber Exhibition.—Gutta Percha extracted from leaves of *Dichopsis Gutta*. Rubber from *Ficus elastica*.

United Malaysian Rubber Co., International Rubber Exhibition.—Trunk of Jelutong (*Dyera costulata*). Photographs of a Jelutong tree and sample of rubber extracted from "Gutta Jelutong."

Malay Development Agency, International Rubber Exhibition.—Samples of Para Rubber and Gutta Percha.

Mr. R. Fyffe, Uganda Section, International Rubber Exhibition.—Tapped stem of Ceara rubber (*Manihot Glaziovii*) also samples of sheet and biscuit Ceara rubber. Rubber from *Clitandra orientalis*, *Landolphia Dawei* and *Hevea brasiliensis*. Photographs of rubber trees.

Mr. H. Powell, East African Protectorate Section, International Rubber Exhibition.—Rubber from *Mascarenhasia elastica* and *Manihot Glaziovii*. Photograph of a Sisal Hemp (*Agave rigida*, var. *sisalana*) Plantation.

Mr. A. E. Aspinall, West Indies Section, International Rubber Exhibition.—Rubber from *Castilloa elastica*, *Ficus elastica*, *Hevea brasiliensis* and *Funtumia elastica*, also seeds of the latter.

Mr. F. A. Stockdale, British Guiana Section, International Rubber Exhibition.—Rubber from *Sapium Jenmani*, *Hevea confusa*, and *Hevea brasiliensis*.

Mr. W. S. D. Tudhope, Gold Coast Section, International Rubber Exhibition.—Rubber and stem of *Funtumia elastica*. Rubber from *Landolphia owariensis*, *Ficus Vogelii*, and *Hevea brasiliensis*. Flowers and seeds of *Manihot Glaziovii*. Flowers of *Manihot dichotoma*. Seeds of *Hevea brasiliensis*. Rubber tapping knife. Ropes used in climbing by natives. Basket used by natives for carrying rubber, &c.

Mr. W. A. Sturdy, Lindfield, Sussex.—Sections of trunks of *Sequoia gigantea* and *Picea excelsa*.

Mr. T. W. H. Hutchinson, Dumfries.—Examples of Clogs and Clog-soles of Alder and Birch in various stages of manufacture.

The Right Honourable Lord Strathcona, Grosvenor Square, London.—Photographs illustrating the regeneration of Larch and Scots Pine, also photographs of Old Scots Pine, Oak, Beech and Larch.

Mrs. Waterhouse, Newbury, Berks—Cones of *Picea pungens* and of its variety *glauca*.

Superintendent, Royal Botanic Gardens, Calcutta.—Seventeen photographic enlargements of views of Cinchona Plantation and Factory at Munsong, India.

Mr. A. E. Aspinall, West Indian Committee, Seething Lane, London, E.C.—A collection of West Indian Produce from the Coronation Exhibition.

Mr. Charles Coltman Rogers, Stanage Park, Brampton Bryan.—Planks of Alder, Birch, Willow, and Hawthorn. Cones of *Picea rubra*.

Mr. W. Steuart Fothringham, Murthly, Perthshire.—Two models of Stock- and Rabbit-proof water-gates.

The Most Honourable the Marquess of Graham, Brodick Castle, Arran—Section of trunk of Larch.

Sir Hugh Shaw-Stewart, Bart., Ardgowan, Greenock.—Section of trunk of *Abies pectinata*.

Messrs. Alex. Jack and Sons, Ltd., Maybole.—Examples of felloes, spokes and naves of wheels of home grown timbers.

The Most Honourable the Marquess of Ailsa, Culzean Castle, Ayr.—Two sections of Ash.

Mr. R. A. Murray Allan, Glenfeochan, Oban.—Transverse section of Larch.

Mr. Thomas Strachan, Keir Estate, Dunblane.—Model of Field gate made of Yew.

Sir C. T. Dyke-Acland, Bart., Killerton, Exeter.—Plank and transverse section of *Cryptomeria japonica*.

Imperial Commissioner of Agriculture, Barbados.—Photographs of Orange (*Citrus Aurantium*) showing gradations towards a condition similar to that in the Navel Orange.

Curator, Economic Garden, Old Calabar.—Sample of native Cotton Yarn dyed with *Indigofera arrecta*.

Senor Annibal Ferreira da Gama, St. Thomé.—Pods and leaves of the different varieties of Cacao cultivated in St. Thomé.

Curator, Botanic Gardens, Dominica.—Fruits of Monkey Cacao (*Theobroma angustifolia*) from a tree fruited for the first time in Dominica.

Mr. Francis de St. Croix, Jersey.—Fruits of Pomegranate ripened on a tree 16 or 17 years old growing in the open in Jersey.

Canon Ellacombe, Bitton Vicarage, Bristol.—Fruits of Pomegranate ripened in the open at Bitton.

Mr. S. Fraser, Kingussie.—Cones of *Pinus Cembra*.

Messrs. Turnbull and Co., Glasgow.—Nineteen samples illustrative of the destructive distillation of wood.

Presentation of a piece of Plate.—The International Rubber Exhibition held in London in July last was made the occasion of an interesting presentation of a handsome silver salver to the Royal Botanic Gardens, Kew, in commemoration of the part played by this institution in the initiation of the Para rubber industry in the Eastern Hemisphere.

The presentation was made by the Rubber Growers' Association at a banquet held on July 7th, 1911, and the salver was accepted on behalf of the Royal Botanic Gardens by Sir W. T. Thiselton-Dyer.

At the same time a telegram was sent by the Chairman to Sir J. D. Hooker, during whose directorship the introduction of *Hevea brasiliensis* to our Eastern possessions took place. In acknowledging the gift, Sir W. T. Thiselton-Dyer said :—

Sir Henry Blake and gentlemen,—I think the Permanent Secretary of the Colonial Office, who is present with us to-night, will agree with me that this is rather a unique occasion in official history. You know that civil servants serve under the Crown, I think I may say, without fear or expectation of favour. When they do their duty they are subject to a good deal of criticism. They are

very glad when their efforts meet with some success. I can honestly say, as far as I know, that the last thing they expect to get is the smallest credit for it. I find myself now in front of a stupendous piece of plate which Sir John Anderson suggests I should take away under my arm. I confess that I find the situation rather embarrassing, but I am very much comforted when I read the inscription because nothing is more impossible than for a servant of the Crown to receive any substantial recognition of anything he has done. What Kew did in this matter was nothing more than its ordinary routine work. That institution now lives in the third century of its existence. As I have reminded my neighbour, the Consul General for Germany, it was founded in the 18th ceutury by a princess of his nation, who, to adopt the words of Mr. Gladstone, "cast her aspirations into the future" of her adopted country when she founded Kew. We have done many things in the past at Kew. When I say "we," I speak of a considerable procession of predecessors in the 18th century. We—that is Kew—tried in the same way as we engaged in the rubber enterprise to transfer the bread fruit from the Pacific to the West Indies. The mutiny of the *Bounty* grew out of that attempt, and there was a chivalrous predecessor of Mr. Wickham in the Kew gardener, who stuck to the captain, and died from exposure in the boat. Peace has its victims as well as war. Well, we succeeded with regard to rubber. I can assure you that on that 14th of June, when Mr. Wickham arrived at Kew in a hansom cab with his precious bag of seeds, not even the wildest imagination could have contemplated its result in this banquet to-night. What we did was done in the most ordinary and routine way. I was the lieutenant then. My chief, who is now in his 95th year, and who has the vigour of youth, but is not allowed to dine out, would have enjoyed very much to be present here to-night; but there is one whom I miss, who was the prime mover in the enterprise—one to whom your cheer should go up—Sir Clements Markham. (Applause.) He was the prime mover also in introducing the *Cinchona* plant into India and giving India the advantage of quinine. He travelled in South America, and I think that out of quinine the idea came to him that he would round off that part of his life's work by giving to the East rubber as well. When I tell you that owing to Markham the natives of Bengal for a farthing can get 5 grains of quinine at any post office, you will realise what he did with the help of Kew in introducing the *Cinchona* tree into India. In the same humdrum way we did the same with rubber. I saw Mr. Wickham's seeds planted. We knew it was touch and go, because it was likely the seeds would not germinate. I remember well on the third day, going into the propagating house where they were planted and seeing that by good luck the seed was germinating. So rapidly did the plants grow—1,900 of them—that we had to have special cases made. On August 12th, 38 cases went out to Ceylon on a P. and O. steamer in charge of a gardener, but I will not bore you with other details. You yourselves are able to judge of the results and you can appreciate the advantage of Kew taking up a matter of this kind. The whole expense of initiation, and the whole burden of finance from first to last, was borne by the India Office, and the people to whom

the colonies in the East ought to be grateful is the Indian Government, which, I am afraid, has reaped very little advantage. You owe it that debt and it is a deep debt. I would also like to point out that Kew is not merely an isolated institution in a London suburb; it is in communication with a network of similar institutions all over the Empire, and it has the advantage of being able to command the assistance and co-operation of all of them. It may interest you to know that owing to advice that nothing of the kind would grow in the plains of Bengal, we refrained from sending these precious *Hevea* plants to Calcutta, but with the consent of the Indian Office, which was generous enough under the circumstances, we sent them to the Ceylon Botanic Gardens. From Ceylon we were able to supply the Straits Settlements, and so we planted the *Hevea* in a climate and under physical conditions which were most suited to them. But, as you know, at that time the East was not ready for them; it required imagination to see their future, but we had scientific colleagues who watched over their growth and helped the enterprise in the best possible way. I need not enumerate their names, they are perpetuated on this salver, which will pass into the custody of my successors at Kew. But I might say a word about my friend, Mr. Ridley, who has assiduously nurtured the rubber industry and fostered its expansion in the Native States. There is nothing more to add except that the thing has been a great success. Kew has attempted many things; some have failed and some have succeeded; and, as far as the officials at Kew are concerned, they feel that it is generous of you to make this presentation. I am sorry my successor is not present to-night, or he would have endorsed what I have said. We have but done our duty. Such a gift is no doubt highly irregular; but what I put to my conscience is that it is not a present to any individual—it is a present to Kew and to the nation, and it will be preserved at Kew as a public memorial. Kew has received many gifts from persons who are anxious to develop its usefulness. This, perhaps, will also answer that purpose as it will give an encouragement for the future. (Applause.)

The salver, which is engraved with the Royal Arms, bears the following inscription :—

PRESENTED
BY A NUMBER OF THOSE INTERESTED IN
THE EASTERN RUBBER INDUSTRY,
TO
THE ROYAL BOTANIC GARDENS, KEW.
TO COMMEMORATE THE INTRODUCTION OF
HEVEA BRASILIENSIS, THE PARA RUBBER,
INTO THE EASTERN HEMISPHERE,
AN ACHIEVEMENT WHICH LAID THE FOUNDATION OF A MOST
IMPORTANT INDUSTRY.

INDIA OFFICE	CLEMENTS MARKHAM.
KEW	HOOKER, THISELTON-DYER.
CEYLON	THWAITES, TRIMEN.
MALAY PENINSULA	CANTLEY, MURTON, LOW, RIDLEY.
COLLECTORS	WICKHAM, CROSS.

1ST JULY, 1911.

The salver has been placed on exhibition in Museum No. I.

Research in Jodrell Laboratory in 1911 :—

Bancroft, K.—A Pine Disease (*Diplodia pinea*, Kickx). (Kew Bull., 1911, pp. 60–62.)

Boodle, L. A. and Dallimore, W.—Report on Investigations made regarding "Beech Coccus" (*Cryptococcus fagi*, Barensprung). (Kew Bull., 1911, pp. 332–343.)

Lawson, A. A.—The Phase of the Nucleus known as Synapsis. (Trans. Roy. Soc., Edinburgh, Vol. xlvii., part 3, pp. 591–604, tt. 1 and 2.)

Maslen, A. J.—The structure of *Mesoxylon Sutcliffii*, Scott. (Ann. Bot., Vol. xxv., pp. 381–414, tt. 33–36.)

Massee, G.—A Disease of the Lilac (*Helminthosporium syringae*, Klebahn). (Kew Bull., 1911, pp. 81–82, with one plate.)

[Massee, G.]—The use of Carbon Bisulphide. (Kew Bull., 1911, pp. 169–170, with fig. in text.)

Massee, G.—A New Paint-destroying Fungus (*Phoma pigmentivora*, Mass.). (Kew Bull., 1911, pp. 325–326, with one plate.)

[Massee, G.]—Root Tumours of Sugar-Beet. (Journ. Board Agric., Vol. xvii., pp. 830–831, with one plate.)

[Massee, G.]—Blister-Canker of Apple Tree (*Nummularia discreta*, Tul.). (Journ. Board Agric., Vol. xviii., pp. 314–315, with one plate.)

[Massee, G.]—A Cucumber and Melon Disease New to Britain. (Journ. Board Agric., Vol. xviii., pp. 670–671, with one plate.)

Takeda, H.—The Japanese Species of *Cerastium*. (Kew Bull., 1911, pp. 100–109, with one plate.)

[Turrill, W. B. and Boodle, L. A.]—A Hybrid Heath. (Kew Bull., 1911, pp. 378–379.)

Mr. L. A. Boodle studied the structure of the bark of the Beech in relation to attacks of the Beech-Coccus, and began an examination of the anatomy of the seed of some Aroids : see above.

Mr. C. O. Farquharson investigated a disease of Water-lilies.

Mr. J. Fraser, on behalf of Lord Avebury, continued the study of pollen-grains begun in 1909.

Mr. H. B. Lacey began an anatomical and experimental investigation of some examples of succulent leaves.

Mr. A. J. Maslen made a further examination of *Mesoxylon Sutcliffii* for the completion of his paper on this fossil plant : see above.

Prof. W. Rothert studied the chloroplasts and chromoplasts in a number of plants.

Mr. W. C. Worsdell continued the preparation of his morphological work on Vegetable Teratology.

Prof. R. H. Yapp investigated the anatomical structure and development of the leaves of *Spiraea Ulmaria* in order to complete some researches on certain ecological problems presented by this species.

Pathology.—The public generally are beginning to realise that the diseases from which plants suffer may in many instances be due to insects or fungi, hence the quantity of material submitted to

Kew for investigation, and the number of reports issued, increases annually. The exceptionally dry season has obviously favoured the growth and extension of many mildews. Wart disease of potatoes shows a decided tendency to attack above-ground parts of the plant, in addition to the tubers. The gooseberry "Cluster-cup"—*Puccinia Pringsheimiana*, Klebahn—has been exceptionally abundant, especially in Scotland, where the fruit, as well as the foliage, has been attacked.

Attention has been given to the diseases attacking sweet peas, asters, &c. The somewhat obscure disease resulting in the death of rhododendron branches has also been investigated.

Diseased material has also been received at Kew from Queensland, New Zealand, Federated Malay States, Nigeria, &c.

Additions to the Herbarium during 1911.—More than 19,000 specimens have been received as donations or exchanges, and about 7,000 have been purchased. The principal collections are enumerated below.

Europe. *Presented* :—A. Jordan's Herbarium, by Miss E. Willmott; Fungi, by Abate G. Bresadola; Russia, by Mr. J. F. Duthie; "Kryptogamae Exsiccatae," cent. xviii. and xix., by the Vienna Hofmuseum; Herbarium Hieraciorum Scandinaviae," cent. xxiii. and xxiv., by Dr. H. Dahlstedt.

Purchased :—Rev. S. Enander, "Salices Scandinaviae," Nos. 101–150; W. Transchel and J. Serebrianikow, "Mycotheca Rossica," fasc. 3–5; H. Sydow, "Mycotheca Germanica," fasc. 20–21; Dr. A. de Degen, "Gramina Hungarica," fasc. 7.

Orient and North Asia. *Presented* :—Siberia, (V. L. Komarov), through the Imperial Botanic Gardens, St. Petersburg; North-west Mongolia, by Mr. M. P. Price; Turkestan and the Caucasus (F. N. Meyer), through the United States Department of Agriculture.

Purchased :—Th. Strauss, Western Persia.

China and Japan. *Presented* :—Shensi and Kansu, by Sir Alex. Hosie; various, by Mr. W. J. Tutcher.

Purchased :—A. K. Schindler, China; Père E. J. Taquet and Dr. R. G. Mills, Corea.

India and Malaya. *Presented* :—Sir G. S. Gough's Herbarium, by the Linnean Society; Col. R. H. Beddome's Fern Herbarium, by Mrs. Beddome; various plants (many Apocynaceae and Asclepiadaceae), by the Royal Botanic Garden, Calcutta; North-West India and Sikkim, by Mr. J. R. Drummond; Burma, by Mr. J. H. Lace; Siam, by Dr. A. F. G. Kerr; Malay Peninsula, by Mr. H. N. Ridley; Philippine Islands, by Mr. E. D. Merrill and Abate G. Bresadola; Borneo, by Mr. H. N. Ridley; Java, by the Leiden Herbarium.

Purchased :—A. D. E. Elmer, Philippine Islands.

Australasia. *Presented* :—Western Australia, by Dr. Alex. Morrison; New Zealand, by Mr. T. F. Cheeseman.

Purchased :—Max Koch, Western Australia; Dr. F. Vaupel, Samoa.

Tropical Africa. *Presented :*—Sierra Leone, by Mr. C. E. Lane-Poole ; Northern Nigeria, by Dr. J. M. Dalziel and Mr. C. C. Yates ; Southern Nigeria, by Mr. and Mrs. P. A. Talbot (through the British Museum), Mr. N. W. Thomas ; French West Africa, by Dr. Aug. Chevalier ; Somaliland, by Dr. R. E. Drake-Brockman ; Belgian Congo (A. Sapin), by the Brussels Botanic Garden, and by the Rev. F. A. Rogers ; Angola, Cazengo, by Mr. John Gossweiler ; Mozambique, by Mr. M. T. Dawe ; North-west Rhodesia, by Miss A. E. Gairdner and Mrs. Macaulay, and by Rev. F. A. Rogers ; Bulawayo and the Matoppo Hills, by Lt.-Col. A. F. Appleton.

Purchased :—C. F. M. Swynnerton, Gazaland.

South Africa. *Presented :*—South-west Africa, Percy Sladen Memorial Expedition, Prof. H. H. W. Pearson, by the Percy Sladen Trustees ; Transvaal, by Lt.-Col. A. F. Appleton ; Basutoland, Dieterlen, by Prof. Ch. Flahault ; various, by Mr. E. E. Galpin and Mr. E. P. Phillips.

Purchased :—Miss Olive Nation, Transvaal ; Miss M. M. Stewart, Swaziland ; Miss Alice Pegler, Kentani ; H. Rudatis, Natal.

North America. *Presented :*—Newfoundland, by Mrs. E. G. Britton ; United States, by the United States National Herbarium ; Bermuda, by the Government of Bermuda.

Purchased :—J. Macoun, Canada ; A. A. Heller, Nevada ; F. S. Collins, " Phycotheca Boreali-Americana," fasc. 34–35.

Mexico. *Purchased :*—C. R. Orcutt.

West Indies. *Presented :*—Jamaica, by Mr. W. Harris ; Jamaica and Bahamas, by Mrs. E. G. Britton ; Dutch West Indies, Dr. J. Boldingh, by the Rijks Herbarium, Utrecht.

Purchased :—Baron Türckheim, San Domingo.

South America. *Presented :*—Venezuela, by Mr. W. P. Handover ; British Guiana, by Mr. F. A. Stockdale ; Brazil, by Mr. F. Theissen ; Bolivia, Mr. R. S. Williams (Sir Martin Conway Expedition), by the New York Botanical Garden.

A set of more than 1200 specimens from various localities has been presented by the Paris Herbarium. Mr. F. Stephani has presented specimens of a new species of *Frullania* described by him. Thanks to the kindness of the Bentham Trustees a collection of figures of fungi, including 7000 sheets, the work of Dr. M. C. Cooke, has recently been presented to the Herbarium. Dr. Cooke's original collection has been installed in the Herbarium for some years, and the total number of sheets of the combined collections amounts to 30,000. The majority are original drawings, and range over the entire family of fungi, special attention having been devoted to the delineation of microscopic forms. The specimens collected by Mr. M. P. Price during his recent expedition through North-west Mongolia have been presented by him. The Corean plants received from Père E. J. Taquet consist chiefly of *Cyperaceae*, *Gramineae* and *Leguminosae*. Mr. H. N. Ridley's contribution contains plants collected by him in Borneo

and various parts of the Malay Peninsula, and includes many new species described by him. Dr. A. F. G. Kerr continues to send excellent specimens from Siam. Mr. T. F. Cheeseman has presented additional specimens used in the preparation of his "Illustrations of the New Zealand Flora," the drawings for which have just been completed at Kew. Colonel Beddome's collection forms a valuable addition to the fern herbarium at Kew. Numerous small collections from Tropical and South Africa have been received in addition to those enumerated above.

During the year nearly 6000 specimens have been received on loan in connection with the preparation of the Flora of Tropical Africa and the Flora Capensis, or for clearing up doubtful points.

Presentations to the Library during 1911.—The Bentham Trustees have presented a copy of William Turner's rare little work, *The Names of Herbes in Greke, Latin, Englishe, Duche and Frenche, wyth the commune names that Herbaries and Apotecaries use*, a small octavo of 64 leaves published in 1548. On account of the rarity and interest of the volume, a reprint, edited by Mr. James Britten, was published for the English Dialect Society in 1881. A copy of *De historia stirpium commentarii insignes* (Lugduni, 1549), by L. Fuchs, in which the fine illustrations of the folio edition of 1542 appear in a very much reduced form, has also been added to the library by the Bentham Trustees and the issues for the year of about thirty serial or periodical works, continuing sets which have been acquired by the same means. In previous notes on presentations to the library references are made to Boudier's *Icones Mycologicae*, a costly work comprising 600 coloured plates and a volume of text. The plates were issued in six series, beginning in 1905, and during the current year the work has been completed by the publication of the volume of text, for a copy of which the establishment is indebted to the Bentham Trustees.

The late Sir J. D. Hooker, O.M., G.C.S.I., continued to the end of his long and brilliant career to manifest in every possible manner his profound interest in the welfare of the various departments at Kew. For many years he gave to the library his personal copies of several of the publications issued by the numerous learned societies and academies of which he was a member, and these now form long series of volumes which are indispensable to the efficient working of the establishment.

From the Trustees of the British Museum has been received the second part of *A Monograph of British Lichens*, by Miss A. L. Smith. The first part, by J. M. Crombie, presented by the same Trustees, was published in 1894.

The Secretary of State for India has presented *The English Factories in India*, by W. Foster. The last volume of the five now issued covers the period from 1634 to 1636. To him also the library is indebted for a copy of the fourth edition of vol. iii. of *Schlich's Manual of Forestry*.

Sir Frank Crisp has presented the *Flora von Thüringen und den angrenzenden Provinzen*, by J. C. Zenker, D.F.L. von Schlechtendal and L. E. Langethal, the drawings by E. Schenk. The work is in twelve small octavo volumes and includes 1439 well-executed plates. *Fleurs des champs et des bois des haies et des murs*, by H. Correvon, has also been presented by Sir Frank Crisp.

A handsome quarto volume entitled: *A Research on the Pines of Australia*, has been received from the authors, Messrs. R. T. Baker and H. G. Smith. The "Pines" of this work belong to the eleven different genera of the Coniferae inhabiting Australia, the largest of which is the genus *Callitris*, with 18 species. *Pinus* itself is not represented in Australia. The present work forms a companion volume to that issued in 1902 on the Eucalypts, which were dealt with by the same authors, who kindly gave a copy to the Kew library.

Dr. Auguste Chevalier has just published under the title *Sudania*, the first volume of an enumeration of the plants collected by him in Tropical Africa, during the years 1898 to 1910. The determinations are in numerical order from no. 1 to no. 12,000, and have been supplied by various botanists. Only 35 copies of the work, which has been reproduced by lithography, have been issued. A copy has reached Kew from Dr. Chevalier, also the sixth fascicle of his work, *Les Végétaux utiles de l'Afrique tropicale*.

Die Vegetation des Untersees (*Bodensee*), by E. Baumann, and *Beiträge zur vergleichenden Anatomie und zur Systematik der Connaraceen*, by G. Schellenberg, are dissertations presented to the library by Dr. Hans Schinz.

Lieut.-Col. J. J. Wood, I.M.S., has presented the manuscript, with additional notes, of his treatise on the Plants of Chutia Nagpur, which forms vol. ii. no. 1, of the *Records of the Botanical Survey of India*; also an interleaved and copiously annotated copy of the published work.

The Index to the second edition of Iinuma Yokusai's *Sōmoku-Dusets* has been added to the library by Mr. T. Makino, through the kind offices of Dr. B. Hayata.

From the University Press, Berkeley, California, has been received a copy of Dr. W. L. Jepson's *Silva of California*, a handsome quarto volume including 85 plates and 3 maps. It forms vol. ii. of the *Memoirs of the University of California*. A copy of Dr. Jepson's *Flora of Western Middle California*, second edition, has been received from the author.

A much enlarged edition of the *Farm Weeds of Canada*, by G. H. Clark and J. Fletcher, elaborately bound, has been presented by the Canadian Government Exhibition Commissioner at the Festival of Empire held at the Crystal Palace during the summer. This work, which contains 76 coloured plates of considerable merit, must be of great value to those for whom it is designed.

Mr. J. H. Maiden has sent parts 12 and 13 of his *Critical Revision of the genus Eucalyptus*, and parts 2 and 3 of his *Illustrations of New South Wales Plants*, as well as reprints of his papers from various Australian societies' journals. The issues for the year of this author's *Forest Flora of New South Wales*, which now extends to part 5 of vol. v., have been received, as were the issues of previous

years, from the Honourable the Secretary for Agriculture, New South Wales. A duplicate set of parts 1 to 36 of this work have been presented by Mr. Finlay Sanderson.

The third part of vol. ii. of *Trees and Shrubs*, edited by C. S. Sargent, has been received from the publishers of the work, Messrs. Houghton Mifflin Company. A note on this valuable publication appeared on p. 382 of the *Kew Bulletin* for 1911. *Plantae Wilsonianae*, an enumeration of the woody plants collected in Western China for the Arnold Arboretum during the years 1907, 1908, and 1910, by E. H. Wilson, is also edited by Prof. Sargent, who has presented the first part issued last July.

A Dictionary of Plant-names, by H. L. Gerth van Wijk, a quarto volume of 1444 pages, has reached the library from the Dutch Society of Sciences, Haarlem. In this volume the arrangement is according to the Latin names, under which are given as far as known the English, French, German and Dutch names. A second volume, in which the common names in the languages mentioned will be alphabetically arranged and followed in each case by the Latin name, is in preparation.

Mr. and Mrs. Antony Gepp have presented a copy of their beautifully illustrated work, *The Codiaceae of the Siboga Expedition*. *Études sur la Flore des Districts des Bangala et de l'Ubangi* (*Congo belge*), by E. De Wildeman, has been received from Messrs. Misch & Thron of Brussels; *Genesis and Development of Sand Formations on Marine Coasts*, by Pehr Olsson-Seffer, from the Board of Directors of Augustana College and Theological Seminary, Rock Island, Illinois; *Die palaeobotanische Literatur*, edited by W. J. Jongmans, vol. ii., from the Direction, 's Rijks Herbarium, Leiden; *Papers and Reports on Cotton Cultivation* (International Association of Tropical Agriculture and Colonial Development), by W. R. Dunstan, from the author; *Icones Orchidearum Austro-Africanarum*, by H. Bolus, vol. ii., from Miss L. Kensit; *The African Rubber Industry and Funtumia elastica*, by C. Christy; *Orchids for everyone*, by C. H. Curtis, from Mr. A. W. Hill; the second part of Dr. Glück's *Biologische und morphologische Untersuchungen über Wasser-und Sumpfgewächse*, from Dr. O. V. Darbishire.

Mr. W. Botting Hemsley has presented *Chloris Platensis Argentina*, by C. M. Hicken, a second copy of *The North American Species of Panicum*, by A. S. Hitchcock and Agnes Chase, and *El Jardin Botánico de Buenos Aires*, by C. Thays. A second copy of the last named work has also been received from the author.

The Physiography of the River Nile and its Basin, by H. G. Lyons, has been presented by the Director General of the Survey Department, Egypt.

Treatises on Algae by M. H. Foslie, Madame Paul Lemoine, and C. J. F. Schmitz, and other papers have been received from their authors, amongst whom may be mentioned Dr. V. F. Brotherus, Dr. C. C. Hosseus, Mrs. Koorders-Schumacher, Messrs. G. Massee, F. Theissen, H. S. Thompson, and Dr. Karl Rechinger, the publications appearing under their names in the supplement to

the Library Catalogue, which will form Appendix II. of the *Kew Bulletin* for 1912.

The establishment is indebted to the Director of the Department of Agriculture, Buitenzorg, the Director of the Agricultural Research Institute, Pusa, Bengal, and the Secretary of Agriculture, Washington, for the numerous valuable publications received from them, most of which are periodicals or serials continuing sets in the library.

An excellent wall map of the Malay Peninsula, compiled by and published for the Straits Branch of the Royal Asiatic Society, Singapore, has been presented by the Society through the kind offices of Mr. H. N. Ridley.

Botanical Magazine for January.—The plants figured are *Begonia* (*Knesebeckia*) *dichroa*, Sprague (t. 8412); *Elliottia racemosa*, Muhl. (t. 8413); *Berberis Wilsonae* Hemsl. (t. 8414); *Disa* (*Herschelia*) *lugens*, Bolus (t. 8415); *Calceolaria cana*, Cav. (t. 8416).

The Begonia is an interesting plant with peculiar shining orange-scarlet flowers. Though placed in the section *Knesebeckia* it occupies a somewhat isolated position and shows striking resemblance to *B. maculata*, Raddi, of the section *Gaerdtia* in which the two segments of the placenta bear ovules on their outer surfaces only. *B. dichroa* may therefore be a hybrid between two species belonging to different sections, but there is no direct evidence in support of this view. The subject of the plate was obtained from Messrs. Haage & Schmidt, Erfurt, in 1907.

Elliottia racemosa is a shrub or small tree now confined to a very small area in northern Georgia and South Carolina, where it is a rare plant. The Kew plants were received from the late Mr. P. J. Berckmans, in 1902, a previous attempt to introduce it in 1894, having failed. One of the plants flowered well in July last, and its racemes of sweet-scented waxy white flowers were quite beautiful. The buds at first pendulous become erect shortly before expanding and the flowers when open are in a more or less horizontal position. Unfortunately all attempts to produce seed have failed.

Among the many new forms of *Berberis* recently introduced from China *B. Wilsonae* is one of the most distinct and attractive. It was found by Mr. E. H. Wilson near Tatien-lu in 1903, and was presented to Kew by Messrs. J. Veitch & Sons in 1907. It is a dwarf spreading plant suitable for rock garden culture, and at Kew the young plants tend to retain their foliage during the winter.

Disa lugens is one of the "blue" Disas. Formerly it was confused with the nearly allied *D. barbata*, Sw., but is easily distinguished by the metallic greenish-purple hue of its flowers. In South Africa it is found on the Cape Flats in moist sandy soil among *Restiaceae* at about 100 feet above sea level. The specimen which forms the subject of the plate was received from Mr. H. J. Elwes of Colesborne.

The *Calceolaria* was raised from seed purchased in 1910 from Mr. J. D. Husbands, Limavida, Chile. It is one of the species peculiar to that country and has been collected by Mr. Elwes as far south as the Baños de Chillan in Nuble at 5000–6000 feet above sea level, and by Prof. Philippi as far north as the province of Coquimbo. The plant bears a striking resemblance when not in flower to a *Stachys* or a *Gnaphalium* with its white woolly leaves. The flowers are borne in elongated lax corymbose inflorescences, and are pale violet or rose-coloured with a scent of violets.

Rubber-yielding Plants from Peru.—Mr. W. Fox, on a recent journey in the territory between the rivers Putumayo and Caquetá, collected five rubber-yielding plants, about which he has furnished the following particulars:—*Hevea Foxii*, Huber, is by far the most common and the best rubber-yielding species, and is the source of the Para rubber of commerce from this region. This species bears the vernacular name of Ituri or Iserai, but these names also appear to be applied to another species of *Hevea*, allied to *H. lutea*. Of the rubber exported from this region 75 per cent. is derived from *Hevea Foxii*, and these trees are the only ones which are properly tapped. All the other rubber plants are cut down for the extraction of their latex.

The *Hevea* is tapped by incisions made with a machete, and the latex is allowed to run down the tree to the ground, where it coagulates. The rubber is recovered in strips, which are taken to a stream and washed, and it is then rolled into rabos or tails, in which form it arrives in London. This crude method is due to the wide area over which the trees are scattered.

Micrandra minor, Benth., bearing the vernacular names Huemega or Wakati Ewickeri, was found fairly evenly distributed, but was becoming scarce owing to the destructive methods of working. The latex of this tree is mixed with that of the *Hevea*, and is also used for wrapping the rabos or tails.

A species of *Castilloa*, probably *C. elastica*, though somewhat different from the type, was also collected, but as leafy specimens only; it bears the name Caucho negro or Efacone. It is only found in quantity near the Caquetá and Putumayo rivers. The sections where the valuable *Castilloa* occurs have not yet been much worked, so that its destruction is not so marked as is the case with the other trees.

Another tree yielding rubber is the Minyadotana, a new species of *Zschokkea* described in *K.B.* 1912, p. 38, under the name *Z. Foxii*, Stapf. The tree is not very widely spread, and is becoming scarce owing to the methods of working. The latex is used for mixing with that of the *Castilloa* and the *Hevea*.

Lastly, a gutta-yielding plant was found which is probably *Sideroxylon cyrtobotryum*, Mart. This plant, which is known by the native name Arórate, is rare and was met with only at Oriente, near the Igara Parana, and the yield is therefore a negligible quantity.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 2.] [1912.

VI.—NOTES ON TREES SUITABLE FOR EXPERIMENTAL FORESTRY.* III. AMERICAN CONIFERS.

W. Dallimore.

The Redwood (*Sequoia sempervirens*, Endl.). If free growth and rapid development were the only qualifications necessary to make this tree a success in British forests, it might be planted without further delay, but it remains to be proved whether the timber will be good enough to warrant extensive plantations. The important place occupied by the species in the lumber trade of America, is, however, a sufficient recommendation to warrant it a good trial here.

An idea of its rapid growth in the British Isles may be gathered from the fact that, although it was not introduced before 1846, there are numerous trees between 70 and 110 feet in height, with girths ranging from 8 to 14 feet. As fast growth is quite natural to the tree, there is no reason to suppose that the timber from forest-grown examples would, on that account, be so coarse as that produced by ornamental specimens.

Sequoia sempervirens is a native of California and is found from the northern boundary of the State, southward to the southern boundary of Monterey County, on the mountain slopes and on flat lands near the rivers, where the atmosphere is moist and the temperature fairly equable.

The United States Department of Agriculture, Forestry Section, has published a Bulletin, No. 38, on "The Redwood." It is divided into three parts, i, "A Study of the Redwood"; ii, "The Brown Rot Disease of the Redwood"; iii, "Insect Enemies of the Redwood." In this Bulletin, which is well illustrated, the redwood and its peculiarities are dealt with very fully, and the following notes have been extracted. The tree reaches its greatest size on the flats where the soil is moist and the atmosphere misty. Under such conditions it grows to a height of 350 feet with a diameter of

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* The previous articles were published in *K.B.*, 1911, p. 211 and p. 303.

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20 feet. On the slopes its maximum height is 225 feet and its greatest diameter 10 feet. Most of the large redwoods are from 400 to 800 years old, but the trees begin to die down and growth falls off after the age of 500 years has been reached. The oldest redwood recorded in the above work showed 1373 annual rings.

The chief requirement of the redwood is moisture at the roots and the nature of the soil appears to be a matter of secondary consideration. According to the Bulletin mentioned above, "moisture available for the roots is the first need of the redwood, as any hilly tract of forest will show. Whenever a small gully, or bench, or basin is so placed as to receive an uncommon amount of seepage, or wherever a creek flows by, there the trees are sure to be largest. Even if the soil be not rich, but merely gravel, and it contains much moisture, the redwood will grow more abundantly there than on richer but drier ground."

Although the redwood may be propagated from seeds, forests are usually replenished by means of sprouts from the old stumps left after felling operations. These sprouts are produced very freely and grow rapidly. Several plates in the Bulletin show how the forest is reproduced by this means. The yield of virgin redwoods under the most favourable conditions is given at from 125,000 to 150,00 cubic feet per acre. In less favoured places it is sometimes as low as 20,000. These figures appear to represent the quantity of timber actually marketed.

Sequoia sempervirens is naturally a light demanding subject, but it is said that trees which have been partly suppressed have the faculty of recovering quickly and growing away again freely as soon as more room and light is given. The wood and its uses are spoken of as follows:—"Redwood possesses qualities which fit it for many uses. In colour it shades from light cherry to dark mahogany: its grain is usually straight, fine, and even; its weight is light; its consistency firm, yet soft. It is easily worked, takes a beautiful polish, and is the most durable of the coniferous woods of California. It resists decay so well that trees which have lain five hundred years in the forest have been sent to the mill and sawed into lumber. The wood is without resin and offers a strong resistance to fire, as is indicated by the record of fires in San Francisco, where it is much used. Insects seldom injure it, because of an acid element its lumber contains. In sea water, however, the marine teredo eats off redwood piling as readily as other timber. Redwood is used for all kinds of finishing and construction lumber, for shingles, railroad ties, electric-light poles, paving blocks, tanks, and pipe staves. It is an excellent wood for all these purposes. As a tie its average life, under heavy traffic, is six to eight years; as shingles it will last as long as 40 years. The chief difficulty in working redwood lies in the seasoning process. The tree absorbs so much moisture that the butt logs will sink in water. Left in the sun, they require three or four years to dry."

Isolated specimens in this country often lose their tops by wind, hence the necessity for forming pure rather than mixed plantations, and planting in valleys rather than on exposed hill sides.

The Deciduous Cypress (*Taxodium distichum*, Rich.).—The many fine examples of this species which are to be found in the British

Isles leads one to suppose that it will prove successful as a forest tree if planted under suitable conditions. Being naturally a moisture-loving subject, it could hardly be expected to thrive under conditions which would suit the Scots pine for instance, but there are many low-lying places where the water is near the surface which would probably provide it with an ideal home. That it is able to grow in water is shown by a tree which has been surrounded by water for several years in the lily pond in the Arboretum at Kew, whilst on Mr. Newdigate's estate near Nuneaton a tree with no soil visible about the base is to be seen growing in the middle of a large lake. Trees perpetually surrounded by water cannot be expected to make such satisfactory progress, however, as those which stand clear of the water, but close enough for the roots to enter. To such trees an occasional flooding is said to cause no inconvenience.

Sargent, "Silva of North America," x. pp. 151–154, gives a description of the species and its peculiarities. The wood is soft, close, straight-grained, not strong, easily worked, and very durable in contact with the soil. Hough, "Elements of Forestry," p. 311, mentions three grades of lumber from this tree known in the timber trade—red, black, and white cypress, differing in the colour of the heartwood. The red and black are most valued, as they are less liable to split than the white. The tree has been described as "one of the great resources of the Southern States," its wood being highly valued for general constructive purposes—railway ties, posts, shingles, cooperage, &c.

It is found from 100 to 150 feet in height and four or five feet in diameter, although trees have occasionally been recorded with a diameter of 11 feet. Though sometimes growing on dry land, it is more frequently confined to low swampy ground in the vicinity of rivers, or to wet hollows amongst forests of other trees. It is distributed from Southern Delaware to Florida and Texas, its largest dimensions being attained towards its more southerly limits.

Fine examples have been recorded from many gardens in the British Isles. These range from 60 to 100 feet in height and from 7 to 13½ feet in girth. Some of them have developed the remarkable knees or upright growths from the roots which are peculiar to the tree when growing in swampy ground in America.

A number of the finest trees about London are to be found at Whitton Park, Hounslow, and Syon House, Brentford. In the former case there are several specimens between 80 and 100 feet in height, the largest one having a girth of 13 feet 7 inches at five feet from the ground. The largest one at Syon is recorded in the "Catalogue of Syon House Trees and Shrubs," 1910, as being 111 feet high and 12 feet in girth. In 1849 it is said that 23 specimens existed there, all of them being more than 50 feet in height.

There can be little doubt that the deciduous cypress is suitable for a pure stand, while it would probably succeed with Sitka spruce in wet but not exposed places. Its narrow fastigiate habit when young, suggests that close planting would be necessary.

J. R. Batterden, "Timber," 1908, says that the timber of *Taxodium distichum* finds a place in the English market, and, in describing its uses, remarks that it is largely used for tanks, vats,

and tubs, and that in New Orleans 90,000 fresh-water cisterns are said to be made of the wood; its value for the purpose lies apparently in its durability when kept continually wet.

The Port Orford Cedar, Lawson Cypress, or Match-wood (*Cupressus Lawsoniana*, A. Murr.).—Several landowners are already trying this species under forest conditions in various parts of the country, with apparently good results, though definite proof of its value for British woodlands is not yet forthcoming. In most places where it has been planted for ornamental purposes, it has given satisfactory results, and has grown rapidly after the first few years, therefore it is reasonable to expect that it will prove suitable for forest culture over a wide area and under many conditions.

Its natural range of distribution is very limited, for it is found in a comparatively small district, lying between Coos Bay in south-eastern Oregon and Klamath river in north-eastern California. In this region, where it extends 30 or 40 miles inland at a low elevation from the coast, the climate is marked by a moderate temperature and a heavy rainfall, with a humid and foggy atmosphere and a large proportion of cloudy days.

Under favourable conditions it attains a height of 200 feet with a diameter of from 6 to 12 feet. Old trees have very thick bark, however, and as much as 18 inches has sometimes to be deducted from the diameter for bark.

Hough, "American Woods," x. No. 241, pp. 41–42, describes the wood as follows:—"Wood light, rather hard and strong, very close grained, easily worked and durable in contact with the soil. It is of a light yellow colour with lighter sap-wood and with a pleasant resinous fragrance. One of the most valuable timbers of N. America in the excellence of its lumber for interior finishing, flooring, boat-building, railway ties, fence posts, etc., and is used extensively in the manufacture of matches. In the last-mentioned use its identity is at once asserted by the characteristic fragrance of the smoke of the burning match. Resin of the wood is a powerful diuretic. This property is so active that workmen in the sawmills, when this lumber is being sawn, are so affected that it becomes necessary occasionally to change to other woods."

The variable character of this species under cultivation necessitates precaution in the selection of seed-bearing trees, those only being selected which are typical of the species and of vigorous and erect habit. By collecting seeds haphazard from a collection of decorative varieties, it is unlikely that the seedlings produced will prove satisfactory when planted under forest conditions.

Elwes and Henry, "Trees of Great Britain and Ireland," v. p. 1207, say that the Lawson cypress has been tried in forest plots at different stations in Prussia, the total area being about 30 acres, and also at Grafrath in Bavaria. After 20 years' experience the wood grown in Germany is found to be as good as that of Oregon. Heartwood is said to begin to form in the tenth year with the characteristic fragrant odour of the timber in America. It is a light-loving tree, and people who have tried it recommend that it should be planted at intervals of three feet.

The Yellow Cypress (*Cupressus nootkatensis*, Lamb.).—This tree is so highly spoken of by American timber experts, that it

appears to be worth a good trial under forest conditions in this country, especially as it gives good results as an ornamental specimen. It is found on the western coast of N. America, from southern Alaska to Mount Jefferson in Oregon, its best proportions being attained about the coast region of British Columbia, in Vancouver Island and in islands off the coast of Alaska, where it ascends to an elevation of from 2000 to 3000 feet. Further south it reaches an altitude of 4000 to 5000 feet in the Cascade Mountains.

Mature specimens are met with up to 100 feet in height with a diameter of from 5 to 6 feet. Elwes, *l.c.* v. p. 1196, records one on the road from Longmire Springs to Paradise Valley on Mount Rainier, as being 108 feet high and 17 feet 10 inches in girth above a place where it forked at 6 feet from the ground, and 26 feet in girth below the fork. The largest tree recorded in England measured, in 1908, 61 feet in height and 5 feet 7 inches in girth. This had been grown in the open and was well branched and of perfect shape. Several other examples between 50 and 60 feet in height are mentioned. These dimensions may be considered as fairly satisfactory, considering that the species does not grow naturally to a very large size and that the trees in question are probably less than 50 years old, for it is only about 60 years since it was first introduced into Europe, through the medium of the St. Petersburg Botanic Garden, though it was discovered by Menzies half-a-century earlier.

Writing of the wood of this tree in "American Woods," x. No. 240, pp. 39–40, Hough, says:—"It is light but moderately hard and brittle, of exceedingly fine, close grain, with a pleasant resinous odour, easily worked and very durable in contact with the soil. It is of a clear, light yellowish colour, with thin, lighter coloured sap-wood." He also says that for cabinet-making it has few equals and that it is exported to China, where it is used as a substitute for satin-wood.

Elwes, l.c., p. 1197, says:—"Though looked on as an ornamental tree only, my experience of it on poor dry soils justifies me in thinking that if it could be procured at a reasonable cost, it would be one of the most valuable trees for such soils that can be planted; because it is not only absolutely hardy under all conditions in every part of the country, but will thrive where no other tree whose timber at all approaches it in value, except perhaps the larch, will grow to any size. Though a slow grower at first, and not likely to attain in this country the dimensions of *Thuya plicata*, it has all the other good qualities of that tree in an even greater degree." On page 1198 he adds that he has such confidence in the tree that he would plant 10,000 under forest conditions on his estate if he could procure them at a forest tree price. On his estate, where he says the soil is not the best kind for Western American Conifers, he contrasts the growth of the Yellow Cypress with that of the Corsican Pine. Six trees of the *Cupressus* planted in 1876 or 1877 were, at the time he wrote, 35 feet high and 2 feet in girth, uniform in height and habit. Corsican Pines planted close by at the same time averaged 40 feet in height.

No difficulty should be experienced in obtaining American seed of this tree and comparatively young specimens in this country

bear seeds freely. The young trees form plenty of fibrous roots and are not difficult to transplant, up to 3 or 4 years of age. Spaced from 3 to 4 feet apart, it might be tried as a pure stand, or it could be mixed with some light demanding subject, for it does not mind a moderate amount of shade. It is probable that it will succeed in the west of England, Scotland and Ireland, rather than in the east of England on account of the more humid atmosphere in the former places.

A number of common names are applied to the tree in addition to that of Yellow Cypress; some of them are Alaska Cedar, Yellow Cedar, and Sitka Cypress. Its cones are sufficiently distinct to enable anyone to distinguish it from Lawson's Cypress, for the scales are pointed, whilst those of *Cupressus Lawsoniana* are plain. The botanical characteristics of the tree are to be found in Sargent's Silva of N. America.

The Western Tamarack (*Larix occidentalis*, Nutt.). Attention has been directed to the virtues of this species on several occasions during the last few years, and several importations of seeds have been made with the object of establishing it under forest conditions. The chief reason for inducing people to plant it is the hope that it will prove immune from larch canker and so form a good substitute for common larch in those places where *Larix europaea* is so liable to be crippled by disease as to make it an unprofitable species to plant. From descriptions of the timber of *L. occidentalis* and the uses to which it is put, it appears to be very similar in quality to that of the European species, hence the superiority of one kind over the other depends mainly on the constitution of the two species.

The Western Tamarack occupies the basin of the Upper Columbian River, and is found at a fairly high elevation—2000 to 7000 feet. Its largest dimensions are attained on the bottom lands of northern Montana and Idaho, where it is said to attain sometimes a height of 250 feet with a diameter of six or eight feet. On slopes of hills and on mountain sides it is much smaller, though it gives satisfactory results even when growing in poor sandy soil.

Hough, "American Woods," x. No. 250, pp. 52–53, says that the wood is heavy, hard, strong, close-grained, with few resin passages, very durable in contact with the soil, and susceptible of a very smooth polish. It is of a rich, orange-brown colour, with thin brownish-white sap-wood. He describes it as one of the most valuable of the coniferous woods of the continent, and as being used for furniture, doors, interior finishing, railway ties, fence posts, &c. Specimens of the wood may be seen in Museum No. 3, at Kew, also a specimen of resin which is collected and eaten by the natives. Hough mentions this resin, and says that it is sweetish, resembling dextrine in properties, and exudes in abundance.

No large trees of *L. occidentalis* appear to exist in this country. At Kew there are a number of trees, 30 to 38 feet high. These are growing with European larch of a similar age, about 30 years, and there is little to choose between the development of the two species. Elwes and Henry, "Trees of Great Britain and Ireland," ii. pp. 395–402, say that a good seed year occurs in America every two or three years. The cones open and liberate the seeds in

September, therefore it is necessary for collectors of seeds to be at work during the first three weeks of that month. There appears to be some difficulty in obtaining seeds through the usual channels, and most of the importations which have been made were by private enterprise. Though the trees at Kew bear cones freely, they invariably fail to perfect their seeds.

L. occidentalis could be tried either as a pure plantation or as a mixture in the same way as the common larch. The latter method of culture would probably be the more successful one.

The Western Hemlock Spruce (*Tsuga Mertensiana*, Carr.). This appears to be the most suitable of the several N. American hemlock spruces for trying under forest conditions in the British Isles for in America it grows to a larger size and produces better timber than *T. canadensis*, Carr., the hemlock spruce of N. E. America, and is hardier than the mountain hemlock, *T. Pattoniana*, Engelm. of California.

Its distribution extends from South-eastern Alaska to San Francisco. It is said to be most abundant in Washington. Oregon and British Columbia; its largest proportions being attained in the humid atmosphere of the coast region from sea level to an altitude of 2000 feet. Where the more favourable conditions prevail, it sometimes attains a height of 200 feet with a girth of 10 feet. Hough says that towards the more northerly parts of its habitat it grows to a larger size than any other forest tree, and he also describes it as the largest representative of the genus.

The wood is described as "light, rather hard, tough, close-grained, susceptible of a good polish, of a pale, yellowish-brown colour with lighter sap-wood" (Hough, American Woods, ix. No. 223, pp. 50–51). It is said to be easily worked, stronger and more durable than eastern hemlock, and to be used to a considerable extent for house-building and general construction purposes, though it suffers to some extent on account of the bad reputation the eastern species has obtained for coarseness. In addition to the timber being valuable for lumber, it makes good pulp for paper-making, and the bark is rich in tannin. The bark has been used by the North American Indians for making into a coarse kind of bread. A specimen of this bread is to be seen in Museum No. 3 at Kew, and an account of the nutritive character of the bark may be found in Sargent's "Silva of North America," xi. p. 93.

The species grows well as an ornamental specimen in many parts of the British Isles, and it is being tried as a forest tree in a few places. In the "Transactions of the Royal Scottish Aboricultural Society," xx. 1907, pp. 101–2, there is a Report on "Experimental Plots at Novar," by Clive Marriott, and *T. Mertensiana* is one of the trees dealt with. Two plots, each one acre in extent, had been planted, one with the hemlock spruce and larch in equal proportions, and the other with pure hemlock spruce. In neither case had the *Tsuga* done well except where a certain amount of shelter was afforded, and the opinion expressed was, that it ought only to be planted in those places where it can have a considerable amount of protection. Compared with Douglas fir grown on another plot, it was a decidedly inferior tree. The plots had been planted from three to five years when the report was drawn up.

The Noble Fir or Oregon Larch (*Abies nobilis*, Lindl.).—The noble proportions assumed by this tree in its native country, together with its decorative qualities, have led to its being planted very widely in British gardens. Unfortunately, in many parts of the country, more particularly in the south of England, it is attacked by an aphis, *Chermes abietis*, which causes ugly warty excrescences to appear on the branches. This pest prevents proper development and ultimately kills the tree. Another disease is also prevalent, especially amongst small plants. In this case the irritation set up by a minute insect causes thick gouty swellings on the branches which check growth, and though an affected tree may live many years, it is always an unsightly object, and eventually dies. In Scotland these diseases do not appear to be so common, and on many estates they have not been found; the trees are making rapid progress and promise to provide a good bulk of timber in a comparatively short time.

The species is found from North Washington to a position south of the McKenzie River in Oregon, its largest proportions being attained on the mountains of north-western Oregon at an altitude of from 2000 to 5000 feet. The finest examples are from 250 to 275 feet high, with a diameter of from six to eight feet. Hough, "American Woods," ix. No. 225, pp. 52–54, describes the wood as light, strong, rather hard, close-grained, of a light yellowish-brown colour, with lighter sap-wood. It is used for the interior finish of houses, boxes, &c. The following description of the tree from which Hough's wood sections were taken is given in the work mentioned above. "Height 254 feet, lowest branch 176 feet from the ground; diameter of trunk four feet from the ground, 63 inches. The trunk was as clear and shapely as a mast, and from it eight logs, 16 feet long, and one 32 feet long were cut. The upper end of the topmost log (160 feet from the ground) was 35 inches in diameter, and just above this the material for the wood sections was cut." He further adds, that "the nine logs were eventually cut into 18,142 feet of magnificent clear lumber."

On the Ardverikie estate of Sir John Ramsden, in Inverness-shire, *Abies nobilis* is the most vigorous of the several kinds of conifers grown. It is quite free from disease, and is looked on as likely to become one of the most useful forest trees for the neighbourhood. A large number of trees have been planted, the majority at an altitude of 800 to 1200 feet. Many trees are from 20 to 40 feet in height. The average rate of growth of trees growing at an elevation of 1200 feet for a period of 30 years is said to have been 15 inches. (*See* account of Ardverikie estate, *Kew Bull.* 1910, pp. 243–246).

The Great Silver Fir (*Abies grandis*, Lindl.). There appears to be a disposition to plant this tree under forest conditions in various parts of Scotland, and if freedom of growth were the only object in view, there would appear to be good cause for its selection. Unfortunately its timber finds less favour with American consumers than that of several other Conifers from Western N. America, hence the undesirability of forming plantations in places where more profitable kinds might be grown. It is, however, worth including in an experimental area, and the chances are that it may

turn out to be as good as some of the other firs. Descriptions of the species record examples up to 300 feet in height, and 4 to 6 feet in diameter, rising with straight clean, columnar trunks to two-thirds of their height, without a branch. Hough, ix. No. 224, p. 51–52, writes of the wood as follows :—" Wood very light, soft, not strong or durable, coarse-grained, easily worked and yielding a very smooth satiny surface. Light yellowish-brown colour, lighter sapwood. The wood of this tree is occasionally manufactured into lumber for interior finishing, boxes, casks, &c., but hitherto has been little valued as compared with the Douglas spruce, giant cedar, &c."

The White Fir (*Abies concolor*, Lindl. & Gord.). The handsome, pyramidal outline of this tree, together with its more or less glaucous foliage, make it popular for ornamental planting, whilst its free growth and comparative freedom from disease, suggest that it may be employed profitably for forest planting, for although the timber is of less consequence than that of several other trees from Western North America, it is of sufficient value to warrant the tree a trial.

The species is described in Sargent's "Silva of North America," xii. pp. 121–124. From that description it would appear that the tree attains its maximum dimensions in certain parts of California where it rises to a height of between 200 and 250 feet with a diameter of 6 feet, but elsewhere it is rarely seen more than 125 feet high and 3 feet in diameter. It covers a wide range of country from Southern Oregon to Colorado and New Mexico, and is most frequently met with in moist valleys at an elevation of from 3000 to 9000 feet.

Its timber does not appear to be exported, though it is used rather largely in the Western States for the manufacture of butter-tubs, boxes, packing-cases, &c., which must be made from scentless wood. It is described by Hough as very light, soft, not strong, coarse-grained, compact, and of a light, buff-brown colour, with sap-wood scarcely distinguishable.

Writing of this tree Sargent says :—" Growing here [Boston] during the last 25 years always vigorously, compact in habit, beautiful in its various shades of blue, and free from disease and the attacks of disfiguring insects, *Abies concolor* is now more full of promise as an ornament of the parks of eastern America than any other fir tree." These words may also be said to describe the opinion formed of the tree in this country, but it remains to be seen how it will succeed under forest conditions. With it may be included the allied species *A. Lowiana*, A. Murr.

The Sitka or Tideland Spruce (*Picea sitchensis*, Trautv. & Mey.).—A great deal of attention has been directed to this tree during the last few years by both British and continental foresters, for it is found to thrive under conditions which are unsatisfactory for the proper development of the common spruce. In cold situations, where the land is wet, young trees are growing well, whereas common spruce under similar conditions has proved a failure. Here and there about the country, more particularly in Scotland, well developed specimens are to be seen, which show that it is not only in a young state that the species is a success. On the

Achnacarry estate in Inverness-shire a tree was noted in 1910 which was 98 feet high and 8 feet 8 inches in girth at 5 feet above the ground. It was possible to compare this tree with a specimen of Douglas fir near by. The latter was apparently the same height, but was 2 inches larger in girth. Both trees were planted in 1865. A small plantation of this species growing under very favourable conditions in Cornwall, was noted a few years ago. Many of the trees had formed leads from 5 to $5\frac{1}{2}$ feet in length as the result of one season's growth. As a contrast to this, young trees planted on boggy land, at an elevation of 800 to 1400 feet in Inverness-shire formed leading shoots, the second year after planting, from 9 to 12 inches in length.

Sargent, in his description of the Sitka spruce in the "Silva," xii. pp. 55–58, says "no tree in the American forest grows with greater vigour or shows stronger evidence of vitality." He also refers to it as "the greatest of all spruce trees," though it does not do well in the Eastern United States.

P. sitchensis occupies an extensive range of country along the Pacific coast, for it occurs from a northerly point in Alaska to Mendocino county in California. It is most abundant and reaches its largest proportions in rich, moist soil in Western Oregon and Washington. In some places it occurs as extensive and almost pure forests, on swampy ground about the mouths of rivers where the influence of the tide is felt. Elsewhere it may be mixed with other trees but either as pure or mixed forest it is common throughout the coastal region. Sargent gives its average height as 100 feet with a diameter of 3 or 4 feet, though he says that it is occasionally met with over 200 feet high with a trunk 15 or 16 feet in diameter, and in its extreme north-western limits, as a low shrub. The timber is of very good quality and is useful for a variety of purposes. Hough, "American Woods," vi, No. 149, pp. 54–55, describes it as "light, soft, strong, with close, straight grain, compact, with satiny lustre, differing from other spruce wood by its dark heart-wood." Amongst other uses, it is employed for general interior finishing, fencing, boat-building, general constructive purposes, cooperage, and wood pulp.

Owing to its partiality for wet places it is probable that it would prove most satisfactory as a pure stand, though where a mild climate prevails a mixture of this tree and deciduous cypress might prove a good combination.

Although the two following species are being planted to some extent, it is very doubtful whether they will ever be of any commercial value in this country.

The White Spruce (*Picea alba*, Link.).—In both England and Scotland an effort is being made to introduce this species as a forest tree, the idea being that it will prove a success in exposed situations where many kinds of trees have little chance. It would, however, be wise to carry on a certain amount of planting of an experimental character before launching out on any great expenditure, in face of the fact that it has not proved to be a very satisfactory ornamental tree in this country, and that, with a few exceptions, the trees of Eastern North America are more difficult

to cultivate successfully in Britain than those from the western side of the continent. Its great hardiness is the principal point in its favour, but it is quite probable that more remunerative trees can be grown quite as well, if not better, than the white spruce up to an altitude at which a paying forest would cease in this country. As a shelter belt for some other tree, it is doubtful whether it would prove a general success on account of its slow growth, therefore there is little that can be advanced in its favour.

Forbes, "Development of British Forestry," p. 119, however, gives an illustration of some nice trees growing at an elevation of 1500 feet in the Pennines.

The Northern Scrub Pine (*Pinus Banksiana*, Lamb.).—On some estates in Scotland the cultivation of this pine under forest conditions has been commenced, but it is very doubtful whether it will ever be of any commercial value. At its best it is a scrub pine, and little can be said in its favour except that it is very hardy, and that it might form cover or shelter at a high elevation where little else would grow. Even then it is probable that *P. montana* var. *uncinata* would prove to be the better tree.

VII.—THE GENUS NAUTILOCALYX.

T. A. Sprague.

Living plants of three obviously congeneric species of *Gesneriaceae* were presented to Kew in 1910 by Messrs. Sander & Sons, St. Albans, for whom they had been collected by Mr. Forget in Peru. One of them flowered in the same year, and was found to be an undescribed species closely allied to *Alloplectus Lynchii*, Hook. fil. (Bot. Mag. t. 7271). As the latter, however, seemed very different from any previously described *Alloplectus*, a further search was made, with the result that several closely allied species were found in the genus *Episcia:* among these were *E. bractescens*, Hanst. (*Centrosolenia bractescens*, Hook. Bot. Mag. t. 4675) and *E. hirtiflora*, Spruce. *E. bractescens* (*Nautilocalyx hastatus*, Linden) is the type and sole species of *Episcia*, section *Nautilocalyx*, Benth. & Hook. fil. (Gen. Plant. vol. ii. p. 1007). It differs from the other species mentioned above in the large bracts, and in the anticous and lateral calyx segments being connate below, but agrees in other technical characters, and has the same facies. It seemed desirable, therefore, to widen the definition of the section *Nautilocalyx* by excluding the two characters peculiar to the type species, so as to admit *Alloplectus Lynchii*, *Episcia hirtiflora* and their allies.

The question next arose as to whether *Nautilocalyx* should be retained as a section of *Episcia*, transferred to *Alloplectus*, or treated as a distinct genus. A preliminary investigation soon showed that *Alloplectus* and *Episcia* were ill-defined, and that until their distinguishing characters were better understood it would be premature to revive the genus *Nautilocalyx*. On account of the nature of the placentation (see below), it was decided to transfer

the section *Nautilocalyx* provisionally to *Alloplectus*; and the three species received from Messrs. Sander & Sons were accordingly described under the names *Alloplectus* (*Nautilocalyx*) *Forgetii*, *A. pallidus* and *A. hirsutus* (Kew Bull. 1910, p. 383; 1911, p. 346). The result of a further investigation is now given.

The genera *Episcia* and *Alloplectus* were distinguished from each other in Benth. & Hook. f., Gen. Plant. vol. ii. 1876, p. 993, key to the genera, by the filaments, which were stated to be free from one another in the former, and united into a posticously split sheath in the latter; on p. 1006, however, they were described as more or less connate at the base in *Episcia*. In the original description of *Episcia* (Martius, Nov. Gen. et Sp. Pl. vol. iii. 1829, p. 39) the filaments were stated to be subulate, and inserted at the very base of the corolla, and they were figured as free from one another in *E. reptans* (t. 217). Hanstein, however, in his conspectus of the genera of *Gesneriaceae* (Linnaea, vol. xxvi. 1853, pp. 206–207) was doubtful as to whether the filaments were not united at the base, and eleven years later he definitely described them as united at the base among themselves and with the base of the corolla, as in *Alloplectus* (Martius, Fl. Bras. vol. viii. pars 1, 1864, p. 401). This has been confirmed by the writer.

The distinction based on the filaments having been found to be illusive, the descriptions of *Episcia* and *Alloplectus* given in Linnaea, vol. xxxiv. pp. 233, 234, 246, 247, the Flora Brasiliensis, the Genera Plantarum and the Nat. Pflanzenfamilien were compared, in order to ascertain in what characters the two genera differed. According to these, *Episcia* includes herbs with usually narrow calyx segments, and a thin infundibular corolla with a limb more than twice as much in diameter as the tube; and *Alloplectus* is composed of shrubs and undershrubs with broad calyx segments, and a somewhat fleshy subcylindric corolla with a limb which is either narrower or not much broader than the tube.

Inspection of the specimens of *Episcia* in the Kew herbarium suggested that that genus, as defined by Hanstein (Linnaea, vol. xxxiv. p. 246), Bentham and Hooker, and Fritsch (Engl. and Prantl, Nat. Pflanz. vol. iv. 3b, p. 166), included several discordant elements which made it impossible to define the genus satisfactorily. As a first step towards segregation, a careful comparison was made between typical species of *Episcia* and *Alloplectus*. Following Hanstein (Linnaea, vol. xxvi. pp. 206, 207), *Episcia reptans*, Mart. (Nov. Gen. et Sp. Pl. vol. iii. p. 41, t. 217) was taken as the type of *Episcia*, in preference to *E. decumbens*, Mart. *Alloplectus sparsiflorus*, Mart. (l.c. 55, t. 223, I. figs. 1–8) was selected as the typical species of its genus, on account of the excellent coloured figure.

On carefully comparing the figures of *Episcia reptans* and *Alloplectus sparsiflorus*, it was noticed that the placental lamellae bore ovules on both surfaces in the former, and on the inner surface only in the latter. If the presence of ovules on both surfaces of the placental lamellae be accepted as characteristic of *Episcia*, the genus can be restricted to the section *Cyrtodeira* (*Euepiscia*), Benth. & Hook. f., including the following species: *E. reptans*, Mart. (Nov. Gen. et Sp. vol. iii. t. 217), *E. cupreata*, Hanst. (Bot. Mag.

t. 4312), *E. splendens*, Hanst. (Bot. Mag. t. 5195), *E. chontalensis*, Hook. f. (Bot. Mag. t. 5925), *E. fulgida*, Hook. f. (Bot. Mag. t. 6136), and *E. Fendleriana*, Kuntze.

This leaves the genera *Physodeira*, Hanst., *Alsobia*, Hanst., *Skiophila*, Hanst., *Centrosolenia*, Benth., *Paradrymonia*, Hanst., *Trichodrymonia*, Oerst., and *Nautilocalyx*, Linden, (which are included under *Episcia* in the Genera Plantarum) to be accounted for. All these have ovules on the inner surface only of the placental lamellae, as in *Alloplectus*, but differ from that genus in the shape of the corolla and in being herbs. It will only be necessary to take into consideration *Centrosolenia* and *Nautilocalyx* on the present occasion : definitions of the remainder* are given by Hanstein in Linnaea, vol. xxvi. pp. 206, 207, and Oersted, Gesneraceae centro-americanae, p. 38.

Centrosolenia was founded by Bentham in Hook. Lond. Journ. Bot. vol. v. 1846, p. 362, on *C. hirsuta*, Benth., a creeping herb collected in British Guiana by Robert Schomburgk. Neither the placentation nor the anthers were mentioned in the original description. A flower-bud from the type specimen was therefore examined by the writer, who found that the placental lamellae bore ovules on the inner surface only, and that the anthers were didymous, with a didymous connective. *Episcia densa*, C. H. Wright (Kew Bull. 1895, p. 17 ; Bot. Mag. t. 7481), has similar placentation and anthers, and is therefore transferred to the genus *Centrosolenia* as *C. densa*, Sprague, comb. nov. It may be noted here that several of the genera segregated from *Episcia* have characteristic anthers. Those of *Nautilocalyx* have a much thickened oblong connective, bearing two parallel mussel-shaped thecae, which dehisce introrsely.

The genus *Nautilocalyx* was described in 1853 by Hanstein (Linnaea, vol. xxvi. pp. 206, 207), according to whom the name appeared two years earlier in Linden, Cat. 1851, p. 12. According to Hooker and Hanstein, Linden gave the name *Nautilocalyx hastatus* to the type species, but this was rejected by Sir W. J. Hooker, who described it in 1852 under the name *Centrosolenia bractescens* (Bot. Mag. t. 4675). There is no evidence to show that Linden's Catalogue of the year 1851 contained a botanical description of the genus or species. The first valid description of the species appears to have been published in 1851, as *Centrosolenia bracteata*, Planch. (Fl. des Serres, vol. vi. p. 322, cum ic.), and the first valid description of the genus seems to have been published in 1853 (Linnaea, vol. xxvi. pp. 206, 207). The type species should accordingly bear the name *Nautilocalyx bracteatus*.

An enumeration of the species of *Nautilocalyx* is appended. As many of the best specific characters are with difficulty observable in a dried state, it has not seemed desirable to attempt the construction of a clavis, but diagnostic characters are given under the species as far as possible. *N. bracteatus* is placed at the head of the list on account of its peculiar characters, and the remaining species follow in chronological order.

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* *Skiophila pulchella* is to be excluded from *Skiophila*. Hanstein transferred it to *Tussacia* in Linnaea, vol. xxxiv. p. 337.

Nautilocalyx, Linden, Cat. 1851, p. 12, nomen ; Hanst. in Linnaea, vol. xxvi. 1853, pp. 206, 207 ; genus hic extensum a *Centrosolenia*, Benth., antheris differt.

Calyx zygomorphus ; segmenta ampla, tenuia, saepius libera (in specie unica, *N. bracteato*, segmenta antica et lateralia inferne connata) ; segmentum posticum calcare corollae basi repulsum, valde curvatum, superne erectum, cetera erecta. *Corolla* subinfundibularis, basi postice calcarata, tubo dorsiventraliter compresso, limbo patulo lobis subaequalibus. *Filamenta* in vaginam postice fissam corollae tubo adnatam connata ; antherae per paria apicibus connectivorum connatae, connectivo dorso valde incrassato, loculis omnino sejunctis parallelis mytiliformibus. *Disci glandula* unica, postica (rarius etiam glandula antica). *Ovarium* placentis bilamellatis, lamellis introrsum tantum ovuliferis.—*Herbae* e basi ramosae, caulibus pluribus erectis subaequalibus (in *N. hirtifloro* caulis radicans). *Cymae* axillares, sessiles, instar fasciculorum.—*Centrosolenia*, subgen. *Ostreochlamys*, Planchon in Flore des Serres, vol. vi. 1851, p. 322. *Episcia*, sect. *Nautilocalyx*, Benth. et Hook. f. Gen. Plant. vol. ii. p. 1007. *Episcia*, sect. *Centrosolenia*, Benth. et Hook. f., l.c., partim. *Episcia*, sect. *Skiophila*, Benth. et Hook. f., l.c., partim. *Alloplectus*, sect. *Nautilocalyx*, Sprague in Kew Bull. 1910, 384.

1. **N. bracteatus**, *Linden* ex Planchon in Fl. des Serres, vol. vi. 1851, p. 322.—*Centrosolenia bracteata*, Planchon, l.c., cum ic. *C. bractescens*, Hook. Bot. Mag. t. 4675 (1852). *Nautilocalyx hastatus*, Linden ex Hook. l.c. ; Hanst. in Linnaea, vol. xxvi. 1853, p. 207, t. 2, f. 44 (vide p. 181). *Episcia bractescens*, Hanst. l.c. xxxiv. 1865–1866, p. 351.

Colombia. Province of Pamplona, 1800 m., *Funck et Schlim*, 1714 (ex Planchon, l.c.).

N. bracteatus differs from the remaining species in having large bracts and in the anticous and lateral calyx segments being connate below. Calyx white below, purple above. Corolla white.

2. **N. villosus**, *Sprague*, comb. nov.—*Drymonia villosa*, Kunth et Bouché in Ind. Sem. Hort. Berol. 1847, p. 12 ; Hook. Bot. Mag. t. 4866 (1855). *Episcia villosa*, Hanst. in Linnaea, vol. xxxiv. 1865-1866, p. 348.

Venezuela. Caracas ; Malcato, *Gollmer* (ex Hanst. l.c.).

Villous with white hairs. Calyx segments long-acuminate. Corolla white ; tube with purple stripes inside ; limb large, flat. Filaments not hirsute above.

3. **N. pictus**, *Sprague*, comb. nov.—*Centrosolenia picta*, Hook., Bot. Mag. t. 4611 (1851). *Paradrymonia picta*, Hanst. in Mart. Fl. Bras. vol. viii. pt. 1, p. 403 (1864), in syn. ; Linnaea, vol. xxxiv. 1865–1866, p. 349, in syn. (vide vol. xxvi. p. 180). *Episcia picta*, Hanst. l.c. 403 (1864) ; l.c. 349.

Amazons Region. *Spruce.*

Calyx segments long-acuminate. Corolla white ; anticous part of tube striped with purple inside. Filaments hirsute above. Disk glands 2.—Placed by Hanstein in the genus *Paradrymonia*, along with *Centrosolenia glabra*, Benth. (Bot. Mag. t. 4552) which has very different anthers. The writer retains *C. glabra*, Benth. as the type (and sole species) of *Paradrymonia*.

4. **N. hirtiflorus**, *Sprague*, comb. nov.—*Episcia hirtiflora*, Spruce, ex Hanst. in Mart. Fl. Bras. vol. viii. pt. 1, p. 402 (1864); Hanst. in Linnaea, vol. xxxiv. 1865–1866, p. 346.

Brazil. Upper Amazons: Manaos, in moist forest, *Spruce*, 1299, 1307.

Stem slender, rooting at the nodes. Pedicels slender, about 1 in. long. Flowers cream-coloured.

5. **N. bullatus**, *Sprague*, comb. nov.—*Centrosolenia bullata*, Lemaire, Ill. Hort. vol. xvi. 1869, t. 607. *Episcia tessellata*, Hort. ex Lemaire, l.c.

Amazonian Peru. Maynas (ex Lemaire, l.c.).

Leaves bullate, upper surface dark green, lower surface purple. Calyx segments nearly as long as the corolla-tube. Corolla pale yellow, very hairy outside.

6. **N. Lynchii**, *Sprague*, comb. nov.—*Alloplectus Lynchii* (*Lynchei*), Hook. f. in Bot. Mag. t. 7271 (1892).

Habitat unknown. The species is said to have been introduced by Linden.

Leaves dark green and nearly glabrous above, purple and puberulous below, blade gradually narrowed into the short petiole. Calyx segments much shorter than the corolla-tube. Corolla pale yellow, hairy outside.

7. **N. Forgetii**, *Sprague*, comb. nov.—*Alloplectus Forgetii*, Sprague in Kew Bull. 1910, p. 383.

Peru. Collected by *Forget* for Messrs. Sander & Sons, St. Albans.

Leaves with very wavy margins, narrowly subtruncate at the base, green above, and glabrous except on the midrib, red on the lower surface on both sides of the midrib and lateral nerves, pale green elsewhere, midrib sparingly villous, nerves and veins appressed-pilose, mesophyll glabrous; petioles 2 in. long or less, villous. Calyx segments much shorter than the corolla-tube. Corolla pale yellow, hairy outside.

8. **N. hirsutus**, *Sprague*, comb. nov.—*Alloplectus hirsutus*, Sprague in Kew Bull. 1911, p. 346.

Stems shortly villous. Leaves with flat margins, cuneate into the base, green on both surfaces, slightly bullate, glabrous above except on the midrib, villous on the nerves below, veins pilose. Calyx segments distinctly shorter than the corolla-tube, shortly villous outside. Corolla pale yellow, hairy outside.

9. **N. pallidus**, *Sprague*, comb. nov.—*Alloplectus pallidus*, Sprague in Kew Bull. 1911, p. 346.

Peru. Collected by *Forget* for Messrs. Sander & Sons.

Whole plant pale green. Leaves with flat margins, gradually narrowed into the base, nearly glabrous above, minutely and sparingly puberulous below, especially on the nerves. Calyx segments much shorter than the corolla-tube, nearly glabrous. Corolla creamy-white, hairy outside, front part of tube purple-striped inside, back part with a broad band of purple blotches inside.

To sum up, the following results have been attained :—

1. Restriction of *Episcia* to the section *Cyrtodeira*, Benth. & Hook. f., which includes creeping herbs with spathulate-oblong calyx segments, a red (rarely pale lilac) corolla with a large flat limb, and placental lamellae bearing ovules on both surfaces.

2. Restoration of *Centrosolenia* to generic rank on the grounds of its different anthers and placentation, which were previously undescribed.

3. Re-establishment of the genus *Nautilocalyx* with a wider scope than originally proposed, so as to include various species previously referred to the genera *Episcia*, *Centrosolenia* and *Alloplectus*.

Excluded Species.

Nautilocalyx panamensis, Seem. Bot. Voy. Herald, p. 250, has been transferred to the genus *Achimenes* by Hemsley (Biol. Centr.-Amer., Bot., vol. ii. p. 475).

VIII.—DIAGNOSES AFRICANAE: XLVI.

1301. **Euchaetis Bolusii**, *Dümmer* [Rutaceae-Diosmeae]; ab affini *E. radiata*, Dümmer, foliis sessilibus anguste ovatis, calycis segmentis ovatis acutis, stylis longioribus facile distinguenda.

Planta circiter 20 cm. alta, caule sparse ramoso, ramis ascendentibus dense foliatis puberulis subrubidis. *Folia* sessilia, stricta, subimbricata, coriacea, 5–7 mm. longa, 2 mm. lata, anguste ovata, apice obtusa, primum utrinque puberula, dorso vix carinata costaque sparsim glanduloso-punctata, intra subconcava demum glabra, nitidula, margine ciliolata. *Bracteae* ascendentes, quam folia angustiores, et paullo longiores, flavidae, superne subviridescentes. *Calycis* segmenta 1·3 mm. longa, ovata, acuta, dorso valde carinata, intra concava, utrinque puberula, margine ciliolato. *Petala* 2 mm. longa, late ovata, subacuta, basi a medio angustata. *Stylus* 1 mm. longus, stigmate capitato.

South Africa. Cape Colony: Bredasdorp Div.; on hills near Bredasdorp, 90 m., *Bolus*, 8473.

It is doubtful whether the relative length of the style is of specific importance in this genus as flowers in the same "head" show variability in this respect. The style of *E. longibracteata*, Schltr., is quoted as "perbrevis," but specimens obviously conspecific have styles slightly exceeding 1 mm. in length.

1302. **Euchaetis Burchellii**, *Dümmer* [Rutaceae-Diosmeae]; affinis *E. ericoidi*, Dümmer, sed ramulis brevioribus dense foliatis, foliis oppositis decussatis minutis subtrigonis, glandulis staminum differt.

Frutex 1·2 m. altus (teste *Burchell*), copiose dichotomo—ramosus, ramulis 2 cm. longis dense foliatis puberulis. *Folia* subtrigona, arcuato-patentia, obtusiuscula, 1·5–2 mm. longa, dorso seriebus binis glandularum impressarum ad costae carinam subplaniusculam instructa, supra sulcata, nitidula, carnosula, denticulato-ciliata. *Flores* solitarii vel bini, saturate rosei, bracteis nullis vel paucis foliosis flores haud excedentibus. *Calycis* laciniae

scariosae, late obovatae, truncatae, breviter apiculatae, 2 mm. longae, dorso medio carinatae, glabrae, intra puberulae, ciliolatae. *Petala* quam calyx duplo longiora, late spatulata, rotundata, mucronata, subtus glabra, supra in medio linea transversa albo-barbata praeterea a medio ad basin producta munita, inferne ciliata. *Stamina* 2·5 mm. longa, antheris glandula anguste-oblonga translucente terminatis. *Stylus* perbrevis. *Carpella* matura 4 mm. alta, glabra, nitidula, reticulata, seminibus subcompresso—ellipsoideis nigris nitidis, hilo fusco.

South Africa. Cape Colony: Coast Region; Mossel Bay Div., sandy hills near the landing place, Mossel Bay, *Burchell*, 6239; 6239B.

1303. **Euchaetis ericoides**, *Dümmer* [Rutaceae-Diosmeae]; affinis *E. abietinae*, Eckl. et Zeyh., sed habitu ramosiore, ramulis junioribus puberulis, floribus minoribus petalisque spatulatis differt.

Fruticulus ad 15 cm. altus, dichotome ramosus, ramulis foliatis albo-puberulis circiter 3 cm. longis. *Folia* sessilia, opposita, haud decussata, subimbricata, ericoidea, subconcava, auguste oblonga, obtusata, 3–4 mm. longa, 0·7–1 mm. lata, dorso convexo-carinata, ad carinam glandulis impressis instructa, utrinque glabra, coriacea, marginibus subhyalinis denticulato-ciliata. *Flores* singuli vel bini, subpedicellati, ad apices ramulorum dispositi, bracteis paucis quam calycis laciniis vix duplo brevioribus. *Calycis* laciniae rigidae, late obovatae vel oblongae, apice rotundatae, obtuse mucronatae, 2 mm. longae, dorso glabrae, medio valde carinatae, intra puberulae, sed demum glabrae, ciliolatae. *Petala* anguste oblonga vel subspatulata, rotundata, submucronata, margine inferne albo-ciliata. *Stamina* calyci aequilonga, antheris glandula minuta subovali flavida translucente terminatis. *Stylus* perbrevis.

South Africa. Without precise locality, *Admiral Sir F. Grey*.

1304. **Euchaetis radiata**, *Dümmer* [Rutaceae-Diosmeae]; affinis *E. longibracteatae*, Schltr., sed foliis petiolatis pubescentibus, floribus minoribus numerosioribusque differt.

Fruticulus circiter 20 cm. altus, caule sparse ramoso, ramis simplicibus ascendentibus superne dense foliatis puberulis ochraceis. *Folia* erecto-patentia, subcomplanata, breviter petiolata, petiolo subtereti 1 mm. longo, lamina 4–12 mm. longa 1–2·5 mm. lata, lineari-lanceolata, subacuminata, dorso minute pubescentia costa saepe basin versus conspicua apicem versus evanida, obscure perforato-glandulosa, infra sparse puberula demum glabra, nitidula margine ciliolata. *Bracteae* foliis similes sed paullo longiores, flores valde excedentes, radiato-patentes, stramineae. *Flores* pedicellati, pedicellis 1 mm. longis glabris, ad apicem aggregati vel in axillis bractearum summorum dispositi, bracteis minoribus interspersis. *Calycis* segmenta erecta, ovato-rotundata, apice cuspidata, dorso subcarinata, extra medio carinato-ciliolata, intra vix concava, nisi margine ciliolato glabra. *Petala* quam calyx longiora, 3 mm. longa, ovato-lanceolata, subacuminata, basi subangustata, extra glabra, intra subcarinata, medio transverse albo-barbata, margine inferne dense albo-ciliata, apicem versus involuta. *Discus* carnosulus, cupuliformis. *Stamina* glabra, calycis segmentis

aequilonga, filamentis planiusculis, antheris atrobrunneis glandula parva orbiculari flavida translucente terminatis. *Stylus* cum ovario 1 mm. longus, glaber, stigmate subcapitato.

South Africa, Cape Colony: Bredasdorp Div.; on hills near Elim, 60 m., *Bolus*, 8532.

1305. **Khaya grandis**, *Stapf in Kew Bull. Add. Ser.* ix. p. 152, anglice [Meliaceae]; a *K. senegalensi*, A Juss., foliis foliolisque multo majoribus, tubo staminali globoso-urceolata, stigmate sessili distincta.

Arbor alta, glabra. *Folia* 4-juga; rhachis petiolo 6–8 cm. longo incluso ad 25 cm. vel paulo ultra longa; foliala oblonga vel subovato-oblonga, saepe obliqua, breviter vel obscure apiculata, basi rotundata vel breviter cuneata, 18–24 cm. longa, 10–12 cm. lata, papyracea viridia, margine magisminusve undulata, nervis lateralibus utrinque 12–16; petioluli 1–1·2 cm. longa. *Paniculae* 7·5–15 cm. longi, 7·5–10 cm. lati, perlaxi; pedicelli brevissimi vel ad 3 mm. longi. *Flores* pentameri. *Calyx* 2 mm. diametro, planus, sepalis rotundatis. *Petala* 4 mm. longa. *Tubus* staminalis globoso-urceolatus, ore vix constrictus, circiter 4 mm. longus. *Antherae* 1–1·6 mm. longae. *Ovarium* disco crenulato adnatum; stigma disciforme, crenulatum, sessile, ovula circiter 15, biseriata. *Fructus* globosus, 6–6·5 cm. diametro, valvis 6–8 mm. crassis; axis 3 cm. alta, latissima, vertice applanata, angulis inter se 2·5 cm. distantibus. *Semina* transverse late elliptica, 2 cm. alta, 3 cm. lata, ala ad latera 4 mm. lata inclusa—*K. grandifolia*, Thompson, Col. Rep. Misc. No. 51, 1908, pp. 4, 6, 87 (nomen.).

Tropical Africa. Upper Guinea: Southern Nigeria; West Province, Tupelle, *Thompson*, 7; without precise locality, *Unwin*, 17.

Mr. H. N. Thompson also records the species (*Col. Rep. Misc.* No. 66, 1910) from a number of localities in Gold Coast Colony, especially in the western part and in the north-west and south of Ashanti, and he figures a leaf, a fruit and a seed (plate 5); but the specimen at Kew (collected on the banks of Lake Bosumptwi), from which the figures were drawn, hardly bears out the identification. It consists of a leaf 1 m. long with 8 pairs of leaflets, and of some mature fruits, which are rather larger than those of typical *K. grandis* from S. Nigeria.

1306. **Khaya Punchii**, *Stapf in Col. Rep. Misc.* No. 51, p. 88, 7, 24, (nomen) *et in Kew Bull. Add. Ser.* ix. p. 152, anglice [Meliaceae]; *K. grandi*, Stapf, affini, sed foliolis minoribus, magis abrupte et distincte acuminatis, ovario disco patelliformi crenato insidente in flore femineo et hermaphrodito superne breviter contracto, in masculo in stylum tenuem distinctum attenuato, stigmate cylindrico-discoideo.

Arbor alta, glabra. *Folia* 3–4-juga; rhachis petiolo 10–12 cm. longo incluso 25–30 cm. longa; foliola ovato-oblonga vel oblonga breviter et plerumque abrupte anguste acuminata, basi rotundata vel breviter lateque cuneata, 10–18 cm. longa, 5–10 cm. lata, papyracea, viridia, margine plus minusve undulata, nervis lateralibus utrinque 9–12; petioluli 6–12 mm. longi. *Paniculae* 15–22 cm. longae, 7·5–10 cm. latae, laxiusculae; pedicelli brevissimi. *Flores* pentameri. *Calyx* ad 1·5–2 mm. diametro, planus, sepalis rotundatis. *Petala*

4–5 mm. longa. *Tubus* staninalis globoso-urceolatus, ore vix contractus, circiter 4 mm. altus. *Antherae* 1–1·3 mm. longae. *Ovarium* disco patelliformi crenato insidens, in flore sterili (masculo) in stylum tenuem distinctum attenuatum, in flore fertili (hermaphrodito vele femineo) superne breviter contractum; stigma cylindraceo-discoideum. *Fructus* globosus, 6–7 cm. diametro, valvis 6–9 mm. crassis; axis 3–3·2 cm. alta, latissima, vertice obtusa, angulis inter se 2·5 cm. distantibus. *Semina* transverse late elliptica, 2–2·2 cm. alta, 3–3·2 cm. lata, ala ad latera 4–5 mm. lata inclusa.

Tropical Africa. Upper Guinea: Southern Nigeria; Ibadan Forest Reserve, *Punch*, 104; Benin, *Unwin*, 18; without precise locality, *Foster*, 89.

Mr. H. N. Thompson (*Col. Rep. Misc.* No. 66, pp. 72, 190) reports *K. Punchii* also from the "fringing" forests (gallery woods) of North Western Ashanti, but there are no specimens at Kew, from this locality.

1307. **Isoberlinia**, *Craib et Stapf* [Leguminosae-Amherstieae]; gen. nov. a *Berlinia*, Sol., paniculis longioribus, floribus minoribus subsessilibus, receptaculo brevi, petalis inter se subaequalibus sepalis subaequialtis vel ea paullulo superantibus recedit.

Receptaculum breve. *Sepala* 5. *Petala* 5, inter se subaequalia, sepala paullulo superantia vel iis subaequalia, posterius quam aliis plerumque parum latius, sessilia vel subsessilia, nunquam longe unguiculata. *Stamina* 10, omnia fertilia, exserta; antherae oblongae, uniformes. *Ovarium* stipitatum, stipite receptaculo postice adnato, ovulis circiter 6; stylus elongatus, filiformis, stigmate parvo terminali. *Legumen* lignosum, compressum; semina rotundata, compressa.—*Arbores* haud armatae. *Folia* abrupte pinnata; foliola rigide chartacea vel coriacea. *Flores* mediocres, in paniculas terminales e racemis spiciformibus constitutas dispositi. *Bracteae* parvae, deciduae; bracteolae magnae, concavae, alabastra obtegentes, post anthesin plus minusve persistentes.

Isoberlinia Dalzielii, *Craib et Stapf*, ab *I. tomentosa*, Craib et Stapf (*Berlinia tomentosa*, Harms), foliolis basi plerumque truncatis vel subcordato-truncatis apice emarginatis differt.

Ramuli fusci, minute cinereo-puberuli. *Folia* abrupte pinnata, ad 30 cm. longa, petiolo ad 10·5 cm. longo ut rhachi fulvo-tomentello suffulta; foliola opposita vel subopposita, utrinque plerumque 4, ovato-lanceolata, late ovata vel oblonga, basi plerumque truncata, inaequalia, apice emarginata vel emarginulata, 6–15 cm. longa, 4–9·5 cm. lata, supra primo pilosula, matura glabra, subtus primo subsericea, matura molliter tomentella, subcoriacea, nervis lateralibus utrinque 8–11 supra conspicuis subtus prominentibus nervis transversis supra conspicuis subtus prominulis; petioluli 1 cm. vix attingentes, indumento ut rhachi. *Panicula* 30 cm. longa, 17 cm. lata, rhachi ramulisque fulvo-tomentellis; bracteae deciduae, deltoideae, vix 5 mm. longae, 4 mm. latae, extra fulvo-tomentellae, intra apicem versus pilosulae; bracteolae 1·1 cm. longae, 9 mm. latae, extra fulvo-tomentosae, intra albo-tomentello-pilosae. *Receptaculum* ad 4 mm. altum. *Sepala* 5, subaequalia, 7 mm. longa, 2 mm. lata, glabra. *Petala* subaequalia, 1 cm. longa, 5 mm. lata, glabra, breviter unguiculata. *Filamenta* 1·4 cm. longa,

basi parce pubescentia. *Ovarium* 7 mm. altum, dense pilosum, 6-ovulatum; stylus 1·6 cm. longus, inferne parce pilosus.

Tropical Africa. Upper Guinea: Northern Nigeria; Kontagora, *Dalziel*, 26.

To this species probably also belongs *Dudgeon*, 8, from Zaria, Northern Nigeria, represented in the herbarium by two leaves and a sketch of the fruit which gives the pod as 26·5 cm. long and 1·1 cm. broad; on the sketch it is noted that the "pod is covered with brown-velvety pubescence."

1308. **Isoberlinia Doka**, *Craib et Stapf* [Leguminosae-Amherstieae]; ab *I. Dalzielii*, Craib et Stapf, foliolis glabris facile distinguenda.

Arbor, inflorescentia excepta, glabra. *Folia* abrupte pinnata, ad 26 cm. longa, petiolo 4·5–7·5 cm. longo suffulta, rhachi petioloque teretibus; foliola utrinque 3, ovato-elliptica, ovata vel ovato-lanceolata, apice rotundata vel plerumque subacuminata, obtusiuscula, interdum parum retusa, basi subtruncata, rotundata vel late cuneata, nonnunquam inaequalia, 8–13 cm. longa, 4·5–7 cm. lata, subcoriacea, nervis lateralibus utrinque 8–10 supra conspicuis subtus prominulis, nervis transversis utrinque subprominulis; petioluli 5–7 mm. longi. *Paniculae* terminales, 12–18 cm. longae, 4–8 cm. latae, e racemis spiciformibus ad 10 cm. longis constitutae, ramulis primo minute pilosulis mox glabris; bracteae late ovatae, acutae, ad 4 mm. longae, deciduae; bracteolae 9 mm. longae, 6 mm. latae, extra minute fulvo-pilosulae, intra appresse albo-pubescentes. *Receptaculum* 3·5 mm. longum, 2 mm. diametro, glabrum. *Sepala* 7 mm. longa, 1·75 mm. lata, subaequalia, glabra. *Petala* ad 1 cm. longa et 3·75 mm. lata, subaequalia, glabra, breviter unguiculata. *Filamenta* 1·4 cm. longa, inferne parce pilosa. *Ovarium* brunneo-pilosum, circiter 5 mm. altum, 6-ovulatum.

Tropical Africa. Upper Guinea: Northern Nigeria; Katagum, *Dalziel*, 364; Sokoto, *Dalziel*, 334.

To this species may be referable *Dudgeon*, 9, from Zaria, Northern Nigeria, represented by two leaves and a sketch of the fruit. From this sketch the pod is about 28·5 cm. long, 7 mm. thick and 7 cm. broad; an accompanying note says "pod glabrous."

1309. **Daniellia caudata**, *Craib* [Leguminosae - Amherstieae]; species ob folia obtuse caudatim acuminata nervosque laterales numerosos patulos distincta.

Arbor, inflorescentia excepta, glabra. *Foliola* opposita, plerumque oblonga, apice caudatim acuminata, obtusa, basi parum inaequalia, late cuneata, 10–11·7 cm. longa, 3·5–4·8 cm. lata, rigide chartacea, nervis lateralibus utrinque numerosis parallelis patulis intra marginem arcuatis inter se 1·5–3 mm. distantibus pagina utraque conspicuis, nervis transversis subconspicuis; petioluli 1 cm. longi. *Pedicelli* 1·2 cm. longi. *Receptaculum* vix 5 mm. altum, 5 mm. diametro, ut in pedicellis dense breviter molliter pubescens. *Sepala* 4, ad 1·7 cm. longa, 0·8–1·1 cm. lata, extra plus minusve pubescentia. *Petala* majora 3, circiter 1 cm. longa, 0·6–1 cm. lata, minora ad 2.5 mm. longa, 1·5 mm. lata, acuminata, acuta. *Filamenta* inferne

pilosa. *Ovarium* praecipue in suturis et in stipite molliter tomentoso-pubescens. *Legumen* 6·5 cm. longum, 3·3 cm. latum, stipite 9 mm. longo vix glabro suffultum.

Tropical Africa. Upper Guinea: Southern Nigeria; Central Province, Agogidigbo, *Unwin*, 179.

1310. **Daniellia Fosteri**, *Craib* [Leguminosae-Amherstieae]; a *D. Punchii*, Craib, cui affinis, cortice haud stramineo, foliolis longioribus acute acuminatis recedit.

Arbor, inflorescentia excepta, glabra; ramuli cortice viridescente laevi subnitido obtecti. *Folia* 27–42 cm. longa, petiolo ad 5 cm. longo suffulta; foliola utrinque 7–9, opposita vel subopposita, oblonga, apice acuminata, acuta, basi inaequalia, latere altero cuneata vel late cuneata, altero rotundata, 17 cm. longitudinis vix attingentia et 5 cm. latitudinis paullo superantia, chartacea, subtus pauci-glandulosa, nervis lateralibus utrinque circiter 10 intra marginem arcuatis supra conspicuis subtus prominulis, nervis transversis supra conspicuis vel subconspicuis subtus prominulis; petioluli 6–8 mm. longi. *Pedicelli* circiter 1·3 cm. longi. *Bracteolae* deciduae. *Receptaculum* circiter 4 mm. altum, 4 mm. diametro, ut in pedicellis molliter tomentoso-pubescens. *Sepala* 4, ad 1·4 cm. longa et 1·2 cm. lata, extra plus minusve pilosula. *Petala* majora 3, 0·8–1 cm. longa, 6–9 mm. lata, extra plus minusve subpilosa, minora circiter 2 mm. longa. *Filamenta* inferne pilosa. *Ovarium* cum stipite dense breviter albo-pubescens.

Tropical Africa. Upper Guinea: Lagos; Mamu Reserve, *Foster*, 156. Southern Nigeria; Western Province, Jebu Ode, *Millson*, 37.

1311. **Daniellia Punchii**, *Craib* [Leguminosae-Amherstieae]; a *D. Fosteri*, Craib, cortice stramineo, foliolis obtuse acuminatis recedit.

Arbor, nisi inflorescentia, glabra; ramuli cortice stramineo nitido vel subnitido obtecti. *Foliola* alterna, lateribus inaequalibus altero oblongo altero oblongo-obovato vel subelliptico, apice acuminata, obtusa, basi inaequalia latere oblongo cuneato vel late cuneato altero late cuneato vel rotundato, 12·5–14 cm. longa, 5·5–6 cm. lata, chartacea, nervis lateralibus utrinque circiter 9 intra marginem arcuatis supra conspicuis subtus prominulis, nervis transversis supra conspicuis subtus prominulis; petioluli circiter 5 mm. longi. *Pedicelli* circiter 1·2 cm. longi, ut in receptaculo inflorescentiaeque ramulis dense breviter molliter fulvo-pubescentes. *Bracteolae* 7 mm. longae, vix 4 mm. latae, deciduae. *Sepala* 4, 1–1·2 cm. longa, 5–9 mm. lata, extra plus minusve pilosula. *Petala* majora 0·9–1 cm. longa, 6–8 mm. lata, plus minusve pilosula, minora oblonga, acuminata, acuta, 3 mm. longa, 1 mm. lata. *Filamenta* basi pilosa. *Ovarium* cum stipite plus minusve pubescens.

Tropical Africa. Upper Guinea: Southern Nigeria; Lagos, Ibadan Forest Reserve, *Punch*, 115.

1312. **Daniellia similis**, *Craib* [Leguminosae-Amherstieae]; a *D. Ogea*, Rolfe, foliolis majoribus formae diversae nervis lateralibus numerosioribus recedit.

Arbor, inflorescentia excepta, glabra; ramuli validiusculi, cortice rubro-brunneo subnitido pauci-lenticellato obtecti. *Folia* 23–27 cm.

longa, petiolo 2–5 cm. longo subterete suffulta; foliola opposita, utrinque 8, oblonga vel oblongo-lanceolata, apice acuminata, basi inaequalia, late cuneata vel rotundata, 6–10 cm. longa, 1·8–3·7 cm. lata, coriacea, nervis lateralibus utrinque circiter 12 intra marginem arcuatis supra conspicuis, margine recurvo; petioluli 5–7 mm. longi. *Pedicelli* ad 1·2 cm. longi, ut in inflorescentiae ramulis receptaculoque molliter tomentoso-pubescentes; bracteolae deciduae. *Receptaculum* 4 mm. altum, 4 mm. diametro. *Sepala* 4, ad 1·6 cm. longa et 1·1 cm. lata, extra plus minusve tomentello-pubescentia. *Petala* majora 1–1·1 cm. longa, 4·5–9 mm. lata, minora acuminata, acuta, 3·5 mm. longa, 1·5 mm. lata. *Filamenta* inferne pilosa. *Ovarium* cum stipite pubescens.

Tropical Africa. Upper Guinea: Gold Coast; without precise locality, *Comm. Imp. Inst.* 1909; *Dudgeon*, 5 (leaf only).

1313. **Paradaniellia**, *Rolfe* [Leguminosae-Amherstiae]; genus novum affine *Danielliae*, J. J. Benn., corolla monopetala vel petalis lateralibus et anticis rudimentariis distincta.—*Daniellia*, Benth. et Hook. f. Gen. Plant. i. 580, ex parte (non J. J. Benn.); Harms in Engl. and Prantl. Nat. Pflanzenfam. iii. 3, 141.

Calycis tubus discifer, anguste turbinatus; segmenta 4, subaequalia, valde imbricata. *Petalum* normale 1, sessile, oblongum; petala lateralia et antica obsoleta vel rudimentaria. *Stamina* 10, libera, filamentis elongatis glabris; antherae oblongo-lineares, loculis longitudinaliter dehiscentibus. *Ovarium* longe stipitatum, stipite basi disco arcte cincto, supra medium circiter 14-ovulatum; stylus elongatus stigmate terminali capitato. *Legumen* stipitatum, oblique ovato-oblongum, subfalcatum, plano-compressum, coriaceum, 2-valve, endocarpio elastice secedente. *Semen* saepissime 1, ex apice pendulum, ovatum, plano-compressum; funiculus, elongatus filiformis, apice in arillum parvum dilatatus; testa dura; albumen nullum; cotyledones planae; radicula brevis, recta.

Paradaniellia Oliveri, *Rolfe*; species unica.

Arbor excelsa, 15–45-metralis, glabra. *Folia* alterna, abrupte pinnata, 15–35 cm. longa; foliola 5–8-juga, oblique ovata vel ovato-oblonga, subobtusa vel breviter et abrupte acuminata, 6–17 cm. longa, basi saepe rotundata, subtus reticulata, plus minusve pellucido-punctata; petioluli 0·5–1·5 cm. longi. *Panicula* ampla, 10–20 cm. longa, 8–15 cm. lata, multiflora, ramis alternis patentibus recurvisve. *Bracteolae* geminatae, caducissimae, tenuiter coriaceae. *Pedicelli* 1–1·3 cm. longi, apice dilatati. *Calycis* segmenta oblonga vel elliptico-oblonga, obtusa, concava, 1–1·3 cm. longa, extus reticulato-rugosa. *Petalum* oblongum vel elliptico-oblongum, obtusum, concavum, 8–10 cm. longum. *Stamina* 2–3 cm. longa. *Ovarium* stipitatum, lanceolato-ellipticum, compressum, 1–1·3 cm. longum; stylus gracilis, circiter 2 cm. longus. *Legumen* oblique ovato-oblongum vel elliptico-oblongum, compressum, apice rostratum, 5–8 cm. longum, 3–4 cm. latum. *Semen* late elliptico-oblongum vel suborbiculare, compressum, 2–2·5 cm. longum. *Funiculus* gracilis, circiter 2 cm. longus.—*Daniellia thurifera*, Oliv. Fl. Trop. Afr. ii. (1871) 300, ex parte (non J. J. Benn); Oliv. in Hook. Ic. Plant. t. 2406; Harms in Engl. Jahrb. xxvi. 209; Volkens in Notizbl. Königl. Bot. Gart. Berlin. App. 22, pp. 89, 92,

fig. 45 ; Guignard in Journ. de Bot. xvi. 69 ; Pobequin Ess. Fl. Guin. Fr. 55, 234, t. 65 ; Engl. and Drude, Veg. Erde, ix. 1, 801, fig. 674.

Tropical Africa. Upper Guinea : Senegambia, *Heudelot*, 364 ; Casamance, at Koulaye Kouraye, *Chevalier*, 2969 ; Northern Nigeria : Nupe, *Barter*, 978 ; Kontagora, *Dudgeon*, 62 ; *Dalziel*, 16 ; Southern Nigeria : Lagos, *Foster*, 151 ; Ishan County, *Dennet*, 102 ; without precise locality, *Unwin*, 23. Chari oriental, Dar Banda, *Chevalier*, 6638.

This noble tree has hitherto been confused with *Daniellia thurifera*, J. J. Benn., but a comparison with the original specimen of the latter at the British Museum shows that it is quite distinct. The latter was described by Bennett in 1855 (*Pharm. Journ.* xiv. 251), being primarily based upon a fruiting specimen collected in Sierra Leone by Dr. Daniel, though the author had "no doubt" that a flowering specimen collected by Afzelius belonged "to the same genus, if not to the same species." The petals were described as three or four. There being no specimen at Kew, another plant was included under the same name, from which came the statement in the generic character, "Petalum 1, sessile, oblongum (v. ex Benn. petala 3–4)" (Benth. et Hook. f., Gen. Plant. i. 580). This was obtained from the specimens, "Senegambia, *Heudelot* ; Niger Expedition, *Barter*," subsequently cited by Oliver under *Daniellia thurifera*, Benn. (Oliv., Fl. Trop. Afr. ii. 300). The second specimen was figured in 1895 as *Daniellia thurifera*, Benn. (Oliv. in Hook. Ic. Plant. t. 2406). Since this period the name has been completely transferred to the new plant. Dr. Harms in 1907 pointed out that two genera had been included under *Daniellia*, and not unnaturally, under the circumstances, limited the latter to the species figured in the Icones Plantarum, describing the other as a new genus under the name of *Cyanothyrsus* (Engl. and Prantl., Nat. Pflanzenfam. Nachtr. iii. 3, 197 ; Engl. Jahrb. xxvi. 269). This, however, is the original *Daniellia*, J. J. Benn., to which the three species given by Dr. Harms must be transferred, as follows : *Daniellia oblonga*, Oliv. (*Cyanothyrsus oblongus*, Harms in Engl. Jahrb. xxvi. 270 ; *D. Soyauxii*, Rolfe (*C. Soyauxii*, Harms, l.c.) ; and *D. Ogea*, Rolfe (*C. Ogea*, Harms, l.c.). This leaves *Daniellia thurifera*, Oliv., without either a generic or specific name, hence that of *Paradaniellia Oliveri*, Rolfe, now proposed. *Paradaniellia* is a tall forest tree, characteristic of dry open savannas, and very widely diffused. Barter describes the flowers as white, and remarks that the natives collect a gum-like copal from the tree. Its economic properties have been dealt with in Kew Bull. Add. Ser. ix. 270, by Mr. J. H. Holland. It is represented at Kew by abundant material.

1314. **Acacia Dalzielii**, *Craib* [Leguminosae - Mimoseae] ; *A. amythethophyllae*, Steud., peraffinis sed foliolis rigidioribus, panicula multo majore eiusque indumento parciore, corolla breviore differt.

Arbor 3–6 m. alta (ex *Dalziel*); rami minutissime puberuli, cortice cinnamomeo obtecti. *Folia* ad 23 cm. longa, petiolo 4–5·5 cm. longo basi glandula sessili plerumque oblonga 0·5–0·8 cm. longa instructo suffulta, rhachi supra, nonnunquam indistincte, canaliculato lateraliter angulato minutissime puberulo ; pinnae utrinque ad

23, 13 cm. longitudine attingentes, rhachi supra canaliculato minutissime puberulo ; foliola utrinque ad 60, linearia, obliqua, acutiuscula, 6–8·5 mm. longa, 1–1·5 mm. lata, distincte uninervata, pauperrime ciliata ; stipulae spinescentes, 1 mm. longae, prorsus directae. *Paniculae* 26–31 cm. longae, 14–15 cm. latae ; rami rigidi, subdivaricati ; ramorum bracteae parvae, rigidae, deciduae ; pedunculi plerumque 3-ni, ad 2·5 cm. longi, puberuli, medio bracteati, bracteis subrigidis in cupulam plerumque 3-lobatam connatis. *Capitula* ad 1 cm. diametro, lutea ; bracteae spathulatae, apice rotundatae, 1 mm. altae, 0·75 mm. latae, dorso carinatae, rigidae, ciliatae. *Calyx* turbinatus, 1·25 mm. altus, lobis brevibus rotundatis ciliatis. *Corolla* cylindracea, 2·5 mm. alta, lobis apice subacutis incrassatis. *Stamina* 4·5 mm. longa ; antherae parvae, connectivo apice glandula stipitata instructo. *Legumen* anguste oblongum, subrectum, apice obtusum, basi angustatum, ad 11·5 cm. longum, 1·7 cm. latum, stipite circiter 1 cm. longo suffultum, valvis rigide chartaceis extra atris tenuiter reticulatis.

Tropical Africa. Upper Guinea : Northern Nigeria ; Sokoto, *Dalziel*, 320.

Vern. Gwanno or Gabacharra.

Shaw, 85, from Yola, in flower only, probably also belongs to this species.

1315. **Acacia Dudgeoni**, *Craib* [Leguminosae - Mimoseae] ; ab affini *A. Senegal*, Willd., pinnis utrinque ad 11, foliola utrinque ad 20 gerentibus differt.

Ramuli stricti, primo parce pubescentes, mox puberuli vel fere omnino glabri, cortice rubro-brunneo striato obtecti ; spinae infrastipulares prorsum arcuatae, infrafoliares recurvae, quam laterales parum longiores et crassiores, 5 mm. longae, omnes brunneae, primo parcissime pubescentes, mox fere glabrae. *Folia* ad 4 cm. longa, petiolo 0·7–1·3 cm. longo ut rhachi pubescente glandula parva rotundata sessili paullo supra basin instructo suffulta ; pinnae utrinque ad 11, 1·3–2·8 cm. longae ; foliola utrinque ad 20, oblongo-linearia, apice rotundata, 3 mm. longa, 1 mm. lata, plerumque pauperrime ciliata, margine parum recurvo. *Spicae* axillares, solitariae, 2·6–4·5 cm. longae, 1 cm. diametro. *Calyx* 1·75 mm. longus, circiter ad medium lobatus, pilis paucis erectis instructus. *Corolla* calycem paullo superans. *Stamina* circiter 4 mm. longa. *Legumen* breviter stipitatum, 3–8·5 cm. longum, 2–2·5 cm. latum, glabrum, valvis reticulatis, seminibus solitariis vel 2–3 brunneis compressis 1 cm. diametro.

Tropical Africa. Upper Guinea : Northern Nigeria ; "said to be common in Borgu," *Dudgeon*, 58 ; Kontagora, *Dalziel*, 41.

1316. **Corynanthe Lane-Poolei**, *Hutchinson* [Rubiaceae - Cinchoneae] ; affinis *C. Johimbe*, K. Schum., foliis minoribus non verticillatis basi vix attenuatis nervis tertiariis arctis parallelis subtus prominentibus, calycis segmentis longioribus differt.

Arbor excelsa, cortice deciduo viridi-brunneo ; ramuli laeves, glabri. *Folia* decussata, suboblique oblongo-elliptica, breviter abrupte acuminata, basi cordata vel rotundata, 9–15 cm. longa, 5–8 cm. lata, rigide coriacea, utrinque glabra, supra paullo nitida, subtus pallida, nervis lateralibus 9–13 patulis supra leviter immersis subtus cum venis arctis parallelis prominentibus ; petioli 4–7 mm. longi,

glabri ; stipulae mox deciduae, lanceolatae, subacutae, ad 1·5 cm. longae, glabrae. *Paniculae* axillares, quam folia paullo lingiores, floribundae ; axis et rami puberuli. *Flores* pallide flavi, demum roseo-purpurei, breviter pedicellati, subumbellatim congesti ; pedicelli ad 1 mm. longi, puberuli. *Receptaculum* subglobosum, 1 mm. longum, puberulum. *Calycis* segmenta subulata, circiter 1 mm. longa, ciliata, extra puberula. *Corollae* lobi lineares, subteretes, 1 cm. longi, glabri. *Antherae* vix 1 mm. longae. *Ovarium* biloculare ; stylus brevis, bifidus, glaber. *Fructus* non visus.

Tropical Africa. Upper Guinea: Sierra Leone ; York Pass, *Lane-Poole*, 46 (1 June, 1911).

1317. **Gardenia (Rothmannia) sokotensis**, *Hutchinson* [Rubiaceae-Gardenieae] ; affinis *G. succosae*, Baker, sed ramis puberulis vix resinosis, foliis minus coriaceis venis laxis, floribus longe pedicellatis differt.

Frutex parvus ; rami teretes, circiter 3 mm. diametro, dense puberuli vel subtomentelli, nodis plerumque 1–2 cm. distantibus. *Folia* subsessilia, elliptica vel oblongo-elliptica, utrinque rotundata, basi interdum subinaequalia, rarius paullo cuneata, 5–8 cm. longa, 2–5 cm. lata, integra, firme chartacea, utrinque minute puberula, nervis lateralibus utrinque 10–13 supra paullo subtus valde promentibus, venis laxis subinconspicuis ; stipulae ovato-triangulares, subacutae, 6–7 mm. longae, basi 5 mm. latae, plus minusve membranaceae, extus puberulae. *Flores* ad apices ramulorum brevium, solitarii, pedicellati ; pedicelli 1–1·5 cm. longi, graciles, viscide puberuli. *Receptaculum* oblongo-obconicum, 2–2·5 mm. longum, puberulum. *Calycis* tubus campanulatus, 3 mm. longus, tenuis, extra leviter viscidus, fere glaber ; lobi lineares, obtusi, dorso carinati, subaequales, 7–8 mm. longi, glabri, virides. *Corolla* alba ? ; tubus infundibuliformis, 1·2 cm. longus, basi 1·75 mm. apice vix 1 cm. diametro, utrinque minutissime puberulus ; lobi 5, suborbiculares, truncati, 0·5 cm. longi et lati. *Antherae* infra medium affixae, lineares, 7 mm. longae, inclusae. *Ovarium* ob placentas centro sese attingentes et cohaerentes spurie 2-loculare ; stylus 7 mm. longus, glaber, profunde bilobus, lobis 6 mm. longis complanatis. *Fructus* ellipsoideus, 1 cm. longus, 0·5 cm. diametro, minute puberulus ; pericarpium membranaceum. *Semina* ∞, punctulata.

Tropical Africa. Upper Guinea: Northern Nigeria; Sokoto, a low shrub on rocky hills, *Dalziel*, 402.

Vernacular—"Gauden duchi."

This plant is remarkable on account of its close affinity with the species quoted above which is found only in Madagascar. In habit and in the structure of its flowers it is very similar, but it differs sufficiently, in the characters given, to be entitled to specific rank.

1318. **Stereospermum leonense**, *Sprague* [Bignoniaceae] ; affine *S. acuminatissimo*, K. Schum., a quo foliolis longius petiolulatis brevius acuminatis, calycis lobis rotundatis vel obtusis inconspicue apiculatis, corolla minus infundibuliformi limbo pro rata minore distinguitur.

Arbor mediocris. *Ramuli* haud exstantes. *Folia* exstantia usque ad 43 cm. longa, 6-juga, glaberrima ; petioli 6–7 cm. longi, ut rhachis atrobrunnei, supra canaliculati, in basin valde ampliati ;

rhacheos internodia 3–5·3 cm. longa; petioluli 3–7 mm. longi marginibus exsiccando inflexis approximatis; foliola elliptico-oblonga vel lanceolato-oblonga (infima interdum elliptica), acutissime acuminata, basi inaequalia latere superiore rotundato inferiore obtuso, 9–13 cm. longa, 4–5 cm. lata, supra opaca nervis brunneis satis obviis venulis majoribus tantum obviis, circa petiolum glandulis nonnullis magnis impressis notata, subtus vix nitidula nervis prominentibus rete venularum densissimo conspicuo glandulis magnis impressis hinc inde inspersis; nervi laterales utrinque 7–10, patuli, intra marginem arcuatim conjuncti. *Cymae* ut videtur multiflorae. *Bracteae* lanceolato-lineares, acutissimae, 2–4·5 cm. longae. *Alabastra* inconspicue apiculata. *Calyx* tubulosus, circiter 1·7 cm. longus, basi circumscisse deciduus, glaber; limbus patulus vel ascendens, breviter bilobus sinibus inaequalibus 3–6 mm. longis; lobi late ovati, obtuse apiculati, circiter 6 mm. lati. *Corolla* 4·5–4·7 cm. longa, anguste campanulato-infundibuliformis; tubi pars inferior cylindrica, circiter 1 cm. longa, intus infra basin staminum glanduloso-pilosa, pars superior circiter 2·5 cm. longa intus antice villosa triente inferiore excepta; lobi suborbiculares, 1·1–1·3 cm. lati, paullo minus longi. *Stamina* circiter 1·2 cm. supra basin corollae tubi inserta; filamenta longiora 2 cm. longa, breviora 1·3 cm. longa, omnia basi glanduloso-pilosa ceterum glabra; antherarum lobi 2·5–2·8 mm. longi. *Staminodium* filiforme, 2·5 mm. longum, capitellatum. *Discus* annularis, 1·3 mm. longus. *Ovarium* tetragonum, 6·5 mm. longum, glabrum, sursum angustatum, faciebus late sulcatis, basi vix 1 mm. diametro; stylus circiter 2 cm. longus.

TROPICAL AFRICA. Upper Guinea: Sierra Leone; Wilberforce, *Lane-Poole*, 56.

1319. **Leucadendron nervosum**, *Phillips et Hutchinson* [Proteaceae-Proteeae]; species foliis ellipticis vel ovato-ellipticis junioribus dense adpresse villosis utrinque prominenter nervosis valde distinctum.

Frutex circiter 2 m. altus; ramuli longitudinaliter sulcati, longe pilosi. *Folia* elliptica vel ovato-elliptica, apice mucronata, 2·5–5 cm. longa, 1·3–2·5 cm. lata, rigide coriacea, juniora dense adpresse villosa, demum adpresse pubescentia, margine cartilaginea, utrinque prominente nervosa. *Inflorescentia* ♂ solitaria, terminalia, oblongo-ellipsoidea, circiter 2 cm. longa et 1·3 cm. diametro, foliis subtendentibus inferne longe villosis. *Bracteae* floriferae oblongae, obtusae, 1·75 mm. longae, paullo concavae, pilosae. *Perianthii* tubus 1 mm. longus, glaber; segmenta spathulato-linearia, 7 mm. longa; limbus oblanceolatus, 1·75 mm. longus, superne incurvus, extus adpresse-pubescens. *Antherae* lineares, 1·75 mm. longae. *Squamae hypogynae* lineares, 1 mm. longae. *Stylus* circiter 6 mm. longus, teres, basi pilosus; stigma clavatum, 1 mm. longum. *Flores* ♀ non visi.

SOUTH AFRICA. Cape Colony: Caledon Div.; mountains near Genadendal, *Burchell*, 7862.

1320. **Bridelia mollis**, *Hutchinson* [Euphorbiaceae-Phyllantheae]; affinis *B. angolensi*, Muell.-Arg., sed foliis supra dense pubescentibus, sepalis ♀ extra rufo-pubescentibus differt.

Arbor parva, circiter 5 m. alta; ramuli juniores brunneo-tomentosi, demum glabri. *Folia* late elliptica vel obovato-rotundata,

apice rotundata vel truncata, interdum leviter emarginata, basi rotundata vel subcordata, 4–12 cm. longa, 3–9 cm. lata, coriacea, supra breviter et dense pubescentia, subtus dense pubescentia, nervis lateralibus utrinque 9–12 ad marginem prolongatis subtus paullo prominentibus, nervis tertiariis arctis subtus leviter prominentibus; petioli 4–5 mm. longi, dense pubescentes; stipulae lanceolatae vel subulato-lanceolatae, 4–6 mm. longae, 2 mm. latae, dense pubescentes. *Flores* ♂ subsessiles vel breviter pedicellati. *Sepala* ovato-triangularia, 3 mm. longa, 2 mm. lata, extra pubescentia. *Petala* late obovata, superne paullo dentata, 2 mm. longa, 1·5 mm. lata, glabra. *Discus* latus, planus, glaber. *Columna* staminalis 1·5 mm. longa, parte filamentorum libera 0·75 mm. longa apicem versus gracili; antherae glabrae. *Ovarii rudimentum* 1 mm. longum, basi dilatatum, glabrum. *Flores* ♀ brevissime pedicellati. *Sepala* ovato-lanceolata, 3 mm. longa, rufo-pubescentia. *Petala* oblongo-lanceolata, sepalis breviora. *Discus* cupularis, lobatus, utrinque glaber. *Ovarium* glabrum. *Fructus* 2-locularis, transverse ellipsoideus vel subglobosus, circiter 8 mm. diametro.—*B. stipularis*, Muell.-Arg. in DC. Prodr. vol. xv. pt. ii. p. 499, partly (as to Kirk's and Burke's Magaliesberg specimens), not of Blume.

Tropical Africa. Mozambique Dist.: Rhodesia; Victoria, *Monro*, 684; 790; Portuguese East Africa: Boruma, *Menyharth*, 858. Tete, *Kirk*.

South Africa. Transvaal: Magaliesberg range, *Burke*. Streydpoort, *Rehmann*, 5393. Near Rustenburg, *Pegler*, 1063. Warm Baths, Waterberg, *Burtt-Davy*, 5603.

This species may be readily distinguished from the Indian and Malayan *B. stipularis*, Blume, with which it was erroneously associated by Müller, among other characters by the absence of the dense ring of long hairs within the base of the female disk.

1321. **Uapaca Gossweileri**, *Hutchinson* [Euphorbiaceae-Phyllantheae]; affinis *U. pilosae*, Hutchinson, sed foliis subtus furfuraceo-pubescentibus pilis intermixtis nervis tertiariis parallelis differt.

Arbor 5–10 m. vel ultra alta; caulis basi circiter 0·5 m. diametro; rami patuli, ramulis robustis junioribus plus minusve tomentosis. *Folia* sessilia, ad ramulorum apices conferta, obovato-cuneata vel elongato-obovata, apice rotundata vel truncata, basi attenuata, 10–27 cm. longa, 5–15 cm. lata, rigide coriacea, supra viridia subscabrida, subtus furfuraceo-pubescentia, demum fere glabra, nervis lateralibus utrinque 12–17 patulis indivisis subtus prominentibus, nervis tertiariis pluribus parallelis; stipulae filiformes, circiter 1·2 cm. longae, dense pilosae. *Capitula* ♂ ramulorum apices versus conferta; pedunculi 1·2 cm. longi, profunde sulcati. *Involucri* bracteae oblongo-ellipticae, obtusae, circiter 1 cm. longae et 0·5 cm. latae, extra leviter pubescentes. *Calyx* irregulariter lobatus; lobi apice parce pilosi. *Filamenta* glabra. *Ovarii rudimentum* late obconicum, superne dense pilosum. *Flores* ♀ juniores non visi. *Fructus* 4-locularis, subglobosus, paullo ultra 2·5 cm. diametro, lenticellis numerosis instructus, glaber. *Pyrenae* dorso bisulcatae.—*U. benguelensis*, Muell.-Arg. in Journ. Bot. 1864, 332, as to specimen with sessile leaves; Hiern in Cat. Afr. Pl. Welw. i. 963, partly.

Tropical Africa. Lower Guinea: Angola; near the River Kutoto, *Gossweiler*, 3206; near Kaconda, *Gossweiler*, 3364;

Gimbundo, *Gossweiler*, 3802; Kului *Gossweiler*, 980; 2937; Huilla; between Lopollo and the River Monino, *Welwitsch*, 453, partly (♂ specimen); near Lopollo, *Welwitsch*, 455 (Herb. Kew non Herb. Mus. Brit.).

The confusion of this species with *U. benguelensis*, Muell.-Arg., was probably caused in the first instance by Welwitsch who distributed the two plants with the same number under the impression no doubt that they represented male and female of one species. Mr. Gossweiler, however, who has kindly examined them with me and who has seen and collected both in a living state, is confident that there are two distinct species.

1322. **Uapaca pilosa**, *Hutchinson* [Euphorbiaceae-Phyllantheae]; species foliis sessilibus subtus longe pilosis pilis erectis nervis tertiariis laxe ramosis valde distincta.

Frutex 1–1·5 m. altus, ramulis junioribus robustis pubescentibus apice tomentosis. *Folia* (juniora) sessilia, ad ramulorum apices conferta, obovato-cuneata, apice rotundata, 13–14 cm. longa, 6–7 cm. lata, integra, tenuiter chartacea, utrinque longe pilosa pilis erectis, nervis lateralibus utrinque 12 patulis prominentibus, nervis tertiariis laxe ramosis supra indistinctis; stipulae subulato-lanceolatae, circiter 5 mm. longae, dense tomentosae, mox deciduae. *Flores* non visi. *Fructus* vix 4 cm. diametro, glaber, exocarpio crustaceo circiter 2 mm. crasso. *Pyrenae* 2·5 cm. longae, 1·2 cm. latae.

Tropical Africa. Mozambique Dist.: Nyasaland; Stevenson Road, *Scott-Elliot*, 8272.

The material described is imperfect, but the species is easily recognised by the characters given above.

1323. **Crotonogyne parvifolia**, *Prain* [Euphorbiaceae-Crotoneae]; species foliis parvis a ceteris plane recedens, proxima tamen *C. lasiocarpae*, Prain, ob ovarium dense setosum.

Frutex 5–6-metralis, rami foliisque glabri. *Folia* alterna, sparsa, breve petiolata, coriacea, anguste lanceolata, obtusa vel subacuta, a triente summo versus basin acutum angustata, margine integra, glabra, 10 cm. longa, 1–1·25 cm. tantum lata, supra saturate-viridia, subtus pallidiora, nequaquam lepidota: nervi laterales utrinsecus ultra 20 sed obscuri; petiolus parce stellato-puberulus, haud lepidotus, 5–6 mm. longus; stipulae ovato-lanceolatae, acutae, 4 mm. longa, stellato-puberulae, haud lepidotae, cito glabrescentes. *Racemi* ad 24 cm. longi, simplices; rhachides glabrae; flores masculi glomerati, glomeruli pauciflori; feminei solitarii versus apicem rhachidis; pedicelli masculi brevissimi, feminei 8 mm. longi, stellato-pubescentes, haud lepidoti; bracteae 2-glandulosae. *Calyx* maris globosus, in alabastro glaucus, demum valvatim 2-lobus, extra stellato-puberulus. *Corolla* alba, gamopetala, calyce longior, tubo late campanulato, intus hirsuto, limbo alte 5-lobo, lobis orbicularibus. *Stamina* circiter 12, exteriora 5, glandulis extrastaminalibus liberis sed contiguis circumcincta. *Calyx* feminei oblongus, stellato-puberulus, haud lepidotus, 4 mm. longus; lobi 5, anguste oblongi, obtusi, eglandulosi. *Petala* 5, alba, imbricata, calyce distincte longiora. *Discus* subinteger. *Ovarium* pilis simplicibus rigidis dense setosum; styli 3, singuli 4-partiti.—*Manniophytum angustifolium*, Baill. in Bull. Soc. Linn. Par. ii. p. 952 (1891).

Tropical Africa. Lower Guinea : Gaboon ; Ogowe, *Thollon*, 134 ; 361 ; 769.

The fact that this species proves to be a *Crotonogyne* renders it necessary to suggest a new specific name, owing to the publication by Dr. Pax of a *C. angustifolia* in Engl. Bot. Jahrb. xix. p. 83 (1894), which differs from the species now described in having much longer leaves and in having a lepidote but not setose ovary. In works in which it is necessary to treat the species now described as *C. angustifolia*, Prain, it may be convenient to substitute the name *C. Soyauxii*, Prain, for the species which in the Flora of Tropical Africa will stand as *C. angustifolia*, Pax.

1324. **Caperonia Buchanani**, *Baker* [Euphorbiaceae-Crotoneae] ; species *C. palustri*, St. Hil., quam maxime affinis sed foliis margine crenatis apte distinguenda.

Herba annua ; caules erecti, simplices, herbacei, superne hispidi, 30 cm. alti. *Folia* breve petiolata, superiora oblonga vel oblanceolato-oblonga, acuta ; inferiora obovata, obtusa, margine crenata, basi cuneata, superiora 3·75–5 cm. longa, inferiora 2·5–3·75 cm. longa, omnia 2–2·5 cm. lata, supra viridia, subtus pallidiora, ibique secus nervos parce hispidula ; nervi laterales utrinsecus 5–7 ; petiolus 4–6 mm. longus, hispidus ; stipulae lanceolatae, 5 mm. longae, caducae. *Racemi* axillares androgyni, 2–2·5 cm. longi, rhachis pedicellisque hispida vel pubescens ; bracteae lanceolatae, parvulae. ♂ *Sepala* 5, elliptico-oblonga, apiculata, glabra. *Petala* 5, valde inaequalia, 3 superiora majuscula, obovata, sepalis longiora, 2 inferiora parvula, oblonga. *Stamina* circiter 10 ; filamenta brevia. ♀ *Sepala* 5–6, inaequalia, obovata, margine parce denticulata, apice apiculata, 2–3 exteriora quam 3 interiora triente breviora. *Petala* 5, oblanceolata, obtusa, sepalis majoribus breviora. *Ovarium* dense muriculis acutis complanatis obsita. *Capsula* muriculata, 6 mm. lata ; sepala accrescentia, 4 mm. longa. *Semina* pallide cinerea, globosa.

Tropical Africa. Mozamb. Dist. ; Nyasaland ; without precise locality, *Buchanan !*

Nearest to *C. palustris*, St. Hil., a South American species which is also widespread in Africa.

1325. **Mareya acuminata**, *Prain* [Euphorbiaceae - Crotoneae] ; species *M. micranthae*, Muell.-Arg., quam maxime affinis ; differt foliis tenuioribus distincte abruptius acute acuminatis.

Frutex vel *arbor* parva ; ramuli glabri. *Folia* petiolata, membranacea, obovato-lanceolata, abruptius acute acuminata, acumine 1–1·5 cm. longo, margine integerrima, a triente summo versus basin cuneatum attenuata, 12–17 cm. longa, 4–5 cm. lata, saturate viridia, utrinque glaberrima ; petiolus glaber, 1·25 cm. longus ; stipulae deciduae. *Spicae* sat numerosae, plus minusve flexuosae, 15–18 cm. longae ; rhachis angulata, glabra ; bracteae ovatae, minutae. *Flores* masculi haud visi ; feminei secus rhachin dispositi, solitarii ; styli a basi liberi. *Capsula* subglobosa, 3-sulcata, 3-cocca ; cocci subglobosi, pubescentes, brunnei, 4 mm. lati.

Tropical Africa. Lower Guinea : French Congo ; Libreville, *Klaine*, 2483.

A very distinct species ; the specimens seen have female flowers only, arranged at intervals throughout the whole length of the spike ;

possibly therefore the species is a dioecious one. In the other species the spikes have female flowers only towards the bases of the spikes, with males in clusters higher up.

1326. **Macaranga gabunica**, *Prain* [Euphorbiaceae-Crotoneae]; species *M. Klaineanae*, Pierre, proxime accedens, sed foliis majoribus ambitu triangulari-ovatis nec elliptico-oblongis, petiolis elongatis, stipulis caducis, capsulisque multo majoribus stylis minus lateralibus facillime distinguenda.

Frutex, ut videtur scandens, ramis elongatis pendentibus, ramulis primum parce rufo-puberulis cito glabrescentibus. *Folia* longe petiolata, triangulari-ovata, longiuscule candato-acuminata, margine integra basi latissime truncata, 8–12 cm. longa (acumine 1–1·5 cm. longo incluso) 7–10 cm. lata, coriacea, supra pallide viridia, opaca, glabra vel parce secus nervum centralem rufo-perberula, subtus pallidiora, secus nervos rufo-pubescentia, glanduloso-punctata, nervi basales 3, 2 minoribus saepissime additis, laterales versus marginem 3–4, medianus utrinsecus 3–4 primarios emittentes, primarii omnes nervis secundariis crebris parallelis obliquis connexi; petiolus 6–8 cm. longus, glaber; stipulae caducissimae haud visae. *Flores masculi* in paniculas angustatas axillares 3–4 cm. longas aggregati; panicularum ramuli perbreves rhachideque dense rufo-pubescentes; bracteae rufo-pubescentes, ovatae, obtusae, integrae, flores plures subtendentes. *Calyx* 2-lobus, rufo-pubescens. *Stamina* 2–3. *Flores feminei* in paniculas axillares 2–6 cm. longas aggregati, panicularum ramuli perbreves; tomentum bracteaeque maris; bracteae flores singulos vel paucos subumbellatos distincte pedicellatos subtendentes; pedicelli 2–3 mm. longi. *Calyx* late cupularis, margine undulatus, rufo-pubescens. *Ovarium* 1-loculare, parum incurvum; stylus parum eccentros. *Capsula* 1-cocca, 1-sperma, 2-valvis, subglobosa, dense rufo-puberula, basi styli minopere lateralis persistente coronata, 1 cm. lata.

Tropical Africa. Lower Guinea: Gaboon; Libreville, *Klaine*, 642; 643; 1152; 1153. French Congo: Niouneron, *Lecomte*, C9.

1327. **Macaranga Klaineana**, *Pierre Mss. ex Prain* [Euphorbiaceae-Crotoneae]; species ut videtur *M. Pynaerti*, De Wild., affinis, differt tamen stipulis persistentibus, tomento rufo-puberulo, bracteis flores subtendentibus quam eae sub panicularum ramulis majoribus.

Frutex scandens, 5–6=metralis. *Ramuli* graciles, rufo-puberuli, sparsim spinulosi; spinuli brevissimi, conici. *Folia* distincte petiolata, ovata vel elliptica, longiuscule caudato-acuminata, margine integra, basi rotundata, 4–7·5 cm. longa (acumine 0·7–1·5 cm. longo incluso), 2–3 cm. lata, chartacea, supra saturate viridia, exsiccando brunnea, glabra, subnitida, subtus pallida, secus nervos parce rufo-pubescentia, ceterum glabra, glanduloso-punctata; nervi primarii utrinsecus 4–5, adscendentes, sub margine anastomosantes, nervis secundariis crebris parallelis transversis connexi; petiolus 1–2·5 cm. longus, parce rufo-pubescens; stipulae lineares, rufo-puberuli, 5–6 mm. longi, subpersistentes. *Flores masculi* in paniculas axillares 4–6 cm. longas aggregati, panicularum ramuli 1·5–2 cm. longi rhachideque rufo-puberuli; bracteae rufo-puberulae,

basales lanceolatae, florales ovatae, acutae vel obtusae, integrae, flores plures subtendentes, basalibus majores. *Calyx* 2-lobus, rufo-puberulus. *Stamina* 2–3, filamentis antheras subaequantibus. *Flores feminei* in paniculas axillares 2–6 cm. longas aggregati, panicularum ramuli 0·4–0·5 cm. longi ; bracteae maris sed florales flores singulos breve pedicellatos vel paucos subumbellatos subtendentes. *Calyx* cupularis, rufo-puberulus, lobis 2–3, inaequalibus, rotundatis. *Ovarium* 1-loculare, incurvum ; stylus lateralis, basi echinatus, incurvo-adscendens. *Capsula* 1-cocca, 1-sperma, 2-valvis, subglobosa, glabra, stylo laterali subpersistente notata, 0·5 cm. lata.

Tropical Africa. Lower Guinea : Gaboon ; Libreville, *Klaine*, 239 ; 347 ; 1118 ; 6436.

1328. **Macaranga Pierreana**, *Prain* [Euphorbiaceae-Crotoneae] ; species *M. Poggei*, Pax, affinis sed ramulis glabris, paniculis petiolisque longioribus et bracteis integris facillime distinguenda.

Frutex ramis longis pendentibus, spinis parvis armatis ; ramulis glabris. *Folia* longe petiolata, ovata, breviter acuminata, margine integra, basi rotundata, ibique 3-nervia supra 2-glandulosa, membranacea, viridia, supra glabra, subtus crebre glanduloso-punctata, secus nervos pilis albis longiusculis patentibus parce obsita ceterum glabra, 8–15 cm. longa, 6–10 cm. lata ; petiolus glaber 7–14 cm. longus ; stipulae caducae. *Flores masculi* in paniculas ampliores axillares dispositi ; rhachis glabra 15 cm. longa, rami glabri, 2·5 cm. longi, ramuli glabri 4–5 mm. longi capitulas strobiliformes 4 mm. longas gerentes ; bracteae puberulae flores 8–10 subtendentes, obovatae, subacutae, margine integrae. *Calyx* 2-lobus, extra puberulus, breviter pedicellatus. *Stamina* 2, filamentis brevissimis vel obsoletis, antheris 4-gonis, locellis 4 approximatis, pollina flavida. *Flores feminei* in paniculas amplas axillares dispositi ; rhachis glabra, 10 cm. longa, rami glabri, 1·5–2 cm. longi, pedicelli fructigeri gracillimi, 5–6 mm. longi, puberuli. *Capsula* parvula, 2 mm. lata, 1-cocca, 2-valvis, extra glaberrima.

Tropical Africa. Lower Guinea : Gaboon ; Monte de Cristal, *Klaine* ; near Libreville, *Klaine*, 1151.

1329. **Klaineanthus**, *Pierre Mss. ex Prain* [Euphorbiaceae-Crotoneae] ; genus *Cunuriae*, Baill., proxime accedens sed disco in flore masculo e glandulis extrastaminalibus bene evolutis composito et foliis basi eglandulosis facillime distinguendum.

Flores dioci, apetali. ♂ *Calyx* basi campanulatus, 5- vel 4-lobus, lobis valde imbricatis. *Discus* e glandulis extrastaminalibus filamentis interioribus alternis, sepalis isomeris iisque oppositis compositus. *Stamina* 10 vel 8, 2-seriata, in receptaculo convexo inserta ; exteriora segmentis calycis alterna ; interiora exterioribus parum longiora ; antherae breves, 2-locellatae, locellis parallelis erectis basifixis, longitudinaliter introrsum dehiscentibus. *Ovarii rudimentum* centrale, oblongum, filamentis interioribus aequilongum, 2–3-fidum. ♀ *Calyx* fere ad basin 5-lobus, rarissime 4-lobus, lobis valde imbricatis. *Discus* cupularis, 5- vel 4-lobus, margine denticulatus. *Staminodia* hypogyna intra discum receptaculo inserta sepalis isomera vel iis panciora vel omnino obsoleta.

Ovarium 3-loculare, glabrum, 3-sulcatum, ovoideum; ovula in quoque loculo solitaria, sub apice inserta funiculo carnoso in arillum expanso; styli 3 alte 2-partiti, ramis singulis apice iterum breviter obtuse 2-lobis. *Capsula* in coccos 3 2-valves dissiliens; epicarpium tenuiter carnosulum; endocarpium lignosum. *Semina* ovoidea, parum complanata, arillo carnoso aurantiaco involuta; testa crustacea; albumen copiosum fere 2-partitum; cotyledones late ovato-cordatae, planae.—*Arbor* mediocris. *Folia* alterna, eglandulosa, distincte petiolata; petioli superne et inferne pulvino incrassati. *Flores* parvuli, laxe paniculati; paniculae amplae, axillares et terminales, ramis dissitis, ramulis brevibus; masculi sub quaque bractea conferti, feminei subsolitarii; pedicelli utriusque sexus articulati. *Fructus* sub dehiscentiam crepitans.

Klaineanthus gaboniae, *Pierre Mss. ex Prain*; species unica.

Arbor 10–15 m. alta, ramulis in vivo ut videtur rubellis, junioribus pubescentibus, adultis griseis, fere glabris. *Folia* petiolata, oblonga vel obovata, obtuse acuminata, margine integra, basi obtuse vel subacute cuneata, 10–20 cm. longa, 4–9 cm. lata, subcoriacea, supra saturate viridia, subtus pallidiora parum nitidula, utrinque glabra; nervi laterales utrinsecus 8–12 prope marginem anastomosantes, subtus sat prominuli; petioli 3–5 cm. longi, subtereti, apice basique pulvinati; stipulae haud visae. *Flores* paniculati; paniculae axillares et terminales, maris 10–20 cm. feminei 8–12 cm. longae, ramis laxis maris inferne 10–20 cm. feminei 8–10 cm. longis, sursum gradatim brevioribus, ramulis brevibus; rhachis ramulisque pubescens vel puberula; bracteae pubescentes parvulae, maris flores 2–6, feminei flores subsolitarios subtendentes; pedicelli utriusque sexus pubescentes, calyce breviores, distincte articulati. ♂ *Calyx* campanulatus, 2 mm. longus, lobis 4–5 tubo aequilongis extra pubescentibus margine ciliatis, valde imbricatis, obtusis. *Stamina* 8 vel 10, 2-seriata, interiora longiora; filamenta basi incrassata, superne subulata, glabra, 1·5–1·75 mm. longa, glandulis 4 vel 5 extrastaminalibus liberis circumcincta; glandulae ovatae, apice subdentatae, glabrae, flavae, staminibus exterioribus alternae, interioribus sepalisque oppositae. *Ovarii rudimentum* centrale obscure 3-gonum saepissime 3-partitum, nonnunquam 2-partitum, staminibus interioribus aequilongum. ♀ *Calyx* fere ad basin 5-sectus, raro 4-sectus, lobis obtusis imbricatis extra pubescentibus, margine ciliatis. *Discus* cupuliformis, glaber, denticulatus, 4–5-lobus. *Staminodia* hypogyna subulata ad normam sepalis isomera disco aequilonga vel longiora, nonnunquam obsoleta. *Ovarium* sessile, 3-gonum, 3-loculare, glabrum; ovula prope basin arillo membranaceo margine fimbriato e funiculo expanso dorsaliter lateraliterque obtecta; styli glabri 3, divaricati, patuli, ad trientem imum 2-partiti, ramis singulis iterum ad apices breviter obtuse 2-lobis. *Capsula* rubra, glabra, 3-sulcata, 2 cm. longa, 2 cm. lata, in coccos 2-valves cum strepitu dissiliens, epicarpio nitido tenue carnosulo, endocarpio lignoso; columella persistens, 3-gona, 1·5 cm. longa. *Semina* ovata, complanata, arillo carnoso luteo obtecta, 1 cm. longa, 8 mm. lata, 5 mm. crassa; testa crustacea, brunnea, nitida; albumen carnosum, fere 2-partitum; cotyledones foliaceae, late ovato-cordatae, basi 3-nerves, 8 mm. longae, 6 mm. latae; radicula minima.

Tropical Africa. Upper Guinea: Cameroons; Bipinde, *Zenker*, 1764; 1853; 3790; 4204.

Lower Guinea: Gaboon; Libreville, *Klaine*, 277; 1352; 1941; 2015; 2461; 2474; 2510; 3200. Sibange, *Klaine*, 2576.

1330. **Hamilcoa**, *Prain* [Euphorbiaceae-Crotoneae]; genus inter *Gelonieas* ob calycem maris imbricatum ponendum sed ob stylos indivisos facillime distinguendum.

Flores dioici, apetali. ♂ *Calyx* globosus; sepala 5, libera, valde imbricata. *Stamina* 18, pluriseriata; antherae subsessiles, 2-locellatae, locellis parallelis, longitudinaliter dehiscentes. *Ovarii rudimentum* 0. ♀ *Calyx* globosus, alte 6-partitus, lobis imbricatis. *Discus* urceolaris. *Ovarium* 2-loculare, glabrum; stylus crassus; stigmata 3, libera, crassa, indivisa. *Capsula* 3-cocca; cocci subglobosi a basi loculicide fissi, pericarpio coriaceo. *Semina* majuscula, globosa; testa spongiosa; cotyledones latae, planae. *Frutex* scandens. *Folia* alterna, valde inaequaliter petiolata; petioli et superne et inferne pulvino incrassati. *Flores* racemosi; racemi axillares; pedicelli utriusque sexus sursum distincte incrassati, fere carnosi.

H. Zenkeri, *Prain*; species unica.

Frutex scandens, 6–9-metralis. *Folia* nunc longe petiolata nunc in eodem ramo fere sessilia, ovato-oblonga, caudato-acuminata, basi late cuneata, margine remote serrata, tenue coriacea, 10–25 cm. longa, 4–10 cm. lata, supra saturate viridia subnitida, subtus pallidiora, utrinque glabra; nervi laterales utrinsecus 8–10 prope marginem anastomosantes, subtus distincte elevati; petiolus basi minopere, apice distincte pulvinatus ibique geniculatus, nunc 4–5 cm. longus, nunc ad pulvinum apicalem reductus 2–4 mm. tantum longus; stipulae haud visae. *Flores* in racemos axillares distincte pedunculatos 6–8-floros dispositi; racemi masculi 2–2·5 cm., feminei 4 cm. longi, pedunculis 8 mm. longis, pedicellis versus apicem distincte incrassatis subcarnosis, masculorum 6 mm. femineorum 12 mm. longis. ♂ *Sepala* 5, libera, valde imbricata, ovato-oblonga, obtusa. *Stamina* 18, fere sessilia; antherae 2-locellatae, longitudinaliter dehiscentes. *Ovarii rudimentum* 0. ♀ *Calyx* 6-partitus, segmentis ovatis obtusis imbricatis. *Discus* urceolatus. *Ovarium* 3-loculare, glabrum; stylus crassus; stigmata 3 libera, crassa. *Capsula* 3-cocca, 2 cm. lata; cocci subglobosi, loculicide dehiscentes. *Semina* globosa, 12 mm. lata; testa laevis, maculata, spongiosa; cotyledones latae, planae.—*Plukenetia Zenkeri*, Pax in Engl. Bot. Jahrb. xliii. 83.

Tropical Africa. Upper Guinea: Cameroons; Bipinde, Mimfia, *Zenker*, 2865; 3028*b*; 3646; 4130.

The imbricate male calyx-segments, the subsessile anthers, and to a less extent the leaves, of *Hamilcoa* recall the monotypic West African genus *Plagiostyles*, Pierre. But *P. africana* (*Daphniphyllum africanum*, Muell.-Arg. in Flora xlvii. 536 [1864]; *Plagiostyles Klaineana*, Pierre in Bull. Soc. Linn. Par. ii. 1327 [1897]), the basis of *Plagiostyles*, differs very greatly in having an oblique, 1-seeded, indehiscent fruit with a lateral style.

IX.—SOME ADDITIONS TO THE KOREAN FLORA.

S. T. Dunn.

Our knowledge of the Korean flora has recently received an interesting addition from Dr. Ralph Mills, who has sent to Kew a collection of some 300 dried specimens of plants collected by him in the neighbourhood of Kangkai. Among them are represented two new species, a new variety, and several new records for the country. Kangkai, or Kangkyei as it is usually written on our maps, is situated near the northern boundary of the country in mountainous surroundings on the bank of the Tong Nai River, the principal affluent of the Yalu upon the Korean side. Its distance from both the east and west coasts is about 80 miles and from the Manchurian frontier 27 miles, and the fact that this part of Korea has scarcely been visited by botanists before adds greatly to the interest of the collection. Dr. Mills describes the mountains among which he gathered his specimens as clothed with vegetation from base to summit, and as bearing a markedly different flora on their northern slopes which drain into the Yalu system from that on the southern. The dividing ridges form indeed at this point a natural line of demarcation between the Manchurian and Korean climates and floras, the moist warm summer season being considerably shorter on the north side, while snow and ice are more frequently seen there and are more persistent. The actual divide follows the crest of the Païk-yek San, which passes from east to west about 30 miles south of the city, and as the much loftier range of the Païk-tou San, the northern watershed of the Yalu basin, lies immediately to the north of it and between it and the greater part of Manchuria, it is a remarkable suggestion and one that will doubtless receive attention that it and not the northern divide forms the phytogeographical boundary between the two floras.

The following species and varieties are new to Korea :—

Euonymus alata, *Thunb.*

Prunus Maacki, *Rupr.*

Neillia Millsii, *Dunn*, sp. nov., *N. sinensi*, Oliv. affinis, calycis tubo breviore, ovulis duobus distincta.

Frutex cortice pallido scabro, ramis floriferis perulatis laxe hirsutis. *Folia* alterna, ovata, acuta, basi truncata, 4–5 cm. longa, grosse biserrata, nonnunquam fere triloba, papyracea, glabra, nervis 4–5-paribus ; petioli 4–5 mm. longi, pubescentes ; stipulae ovatae, 4–6 mm. longae, foliaceae. *Racemi* vel, ob ramos paucos breves, paniculi terminales, sessiles, 6–10 cm. longi. *Flores* approximati, 6–8 mm. longi, 3–4 mm. lati ; pedicelli 4 mm. longi, ut raches, bracteaeque laxe pubescentes ; bracteae lineares, pedicello paullo longiores. *Calyx* campanulatus, extus glandulis pedicellatis vestitus, intus minute puberulus, dentibus 5 tubo bis brevioribus lanceolatis. *Petala* 5, ovata, alba, 3 mm. longa, fauce inserta. *Stamina* ibidem, numerosa, petalis bis breviora, filamentis basi paullo dilatatis. *Ovarium* uniloculare, liberum, globosum, in stylo aequilongo angustatum, stigmate disciforme faucem paullo excedente. *Ovula* 2, a placenta parietali pendula.

Kangkai, Oct. 6th, 1909, *R. Mills*, 107.

A handsome bush when in flower, growing abundantly on the hillsides from Kangkai down the Tong Nai to its junction with the Yalu and thence down to within a few miles of Antung in Manchuria. The fruit is described as green with soft prickles, appearing about midsummer.

Scolopia japonica, *Max.*, **var. parviflora**, *Dunn*, **var. nov.** *Flores* 1·5–1·7 cm. longi.

Kangkai, *R. Mills*, 216. A weed of waste ground.

Chenopodium glaucum, *Linn.*

Chloranthus japonicus, *Sieb. et Zucc.*

Humulus japonicus, *Sieb.*

Allium lineare, *Linn.*

Erythronium Dens-canis, *Linn.* Quite abundant in rich woods on the higher hills and also in the open ground. The flowers sometimes as much as 5 inches across. The species has not, hitherto, been recorded from the region embraced in Hemsley's *Enumeration Pl. China*. *R. Mills*, 217.

Lilium concolor, *Salisb.*

L. elegans, *Thunb.*

Polygonatum verticillatum, *All.*

Tovaria japonica, *Baker.*

Lloydia triflora, *Baker.*

Arisaema japonicum, *Blume.*

Acorus Calamus, *Linn.*

Carex Millsii, *Dunn*, sp. nov. *C. cryptostachyo*, Brongn. affinis, foliis brevioribus, latioribus distincta.

Folia basalia anguste oblanceolata, acuta, ad basin gradatim angustata, ad 30 cm. longa, 2–3 cm. lata, papyracea, glabra, supra scaberula, basi vestigiis fibrosis cincta, nervis multis, 3 conspicuis. *Scapi* 3–4, circiter foliis aequilongi, basi vaginis paucis brevibus vestiti. *Spicae* 5–6, distantes, saepissime singulae, androgynae, 1·5–2 cm. longae, dimidio superiore masculo, inferiore foemineo, parte foeminea ovale viridula ; pedunculi spicis 2-plo longiores ; bracteae pedunculis paullo breviores, ovatae, convolutae, pedunculum scapumque amplectentes, margine scariosae. *Flores* foeminei 6–9 ; glumae ovatae, 3 mm. longae, acutae, margine scariosae ; utriculus aequilongus, ovalis, brevissime rostratus, glaber, paucinervis ; stylus trifidus.

Kangkai, *R. Mills*, 104, May 20th, 1910. In mossy ground among bushes on an isolated hill opposite the town.

X.—MISCELLANEOUS NOTES.

Mr. Charles Cumming Calder, B.Sc. of the University of Aberdeen, has been appointed by the Secretary of State for India in Council, on the recommendation of Kew, Curator of the Herbarium of the Royal Botanic Gardens, Calcutta, in succession to Mr. W. W. Smith (*K.B.*, 1907, p. 403), who has been transferred to the post of Assistant to the Regius Keeper of the Royal Botanic Garden, Edinburgh.

Longevity of Seeds.—An interesting instance of prolonged vitality in the case of the seeds of a Leguminous species is recorded in a letter addressed to Kew by Sir William Herschel, Bart. Sir William writes, under date 22 Jan., 1912 :—"ALBIZZIA LOPHANTHA. An interesting case of germination and flowering of *A. lophantha* after the seeds had been lying dormant 68 years induces me to write to you. The seeds were part of a packet received by Sir John Herschel from the Cape of Good Hope in 1843 and preserved, since his death in 1871, in his cabinet. Seven plants have been successfully reared in 1910 and 1911, of which one, two years old is now some ten or eleven feet high and has flowered abundantly (not seeded) this autumn. From several letters that have passed between Professor Vines and myself, I have gathered much interesting information about the provenance of these seeds and from Sir John's correspondence it is clear that so far back as 1834–5 he was studying them in Africa. I find also now a letter from (Sir) Joseph Hooker acknowledging (to a Mrs. L. Wilson) the receipt at Kew, 16 or 26 March, 1844, of what he describes as 'interesting seeds . . . . gathered in Australia' passed on to him as from Lady Herschel. I have little doubt they formed part of the 1843 packet."

In the same letter Sir William was so good as to offer to send to Kew the flowering example of *A. lophantha* referred to above; at the same time he asked whether the letter from Sir Joseph Hooker could be verified.

In the collection of correspondence at Kew no reference has been found to this matter, but in one of the Record Books there is the following entry in March, 1844 :—"Received from Lady Herschel 48 papers of seeds from S. . . . ."

The curious fact that the entry has been left incomplete in itself seems sufficient evidence that it refers to the same consignment as that to which the packet of seeds in Sir John Herschel's cabinet, some of which have germinated after an interval of 68 years, belongs. The letter from Mrs. L. Wilson transmitting the seeds on behalf of Lady Herschel has not indeed been preserved, but that this letter said "S. Australia" is almost certain because in a subsequent communication, under date 27 Jan., 1912, Sir William Herschel says that the acknowledgment sent by Sir Joseph Hooker has the words "S. Australia" and these words "are in Hooker's own hand." That the seeds did actually come from Australia in the first instance is almost certainly correct. But it was apparently known at Kew that these seeds had been sent to Sir John Herschel from South Africa, as explained in Sir William Herschel's letter; the writer of the entry in our Record Book, undecided as to whether the word "Africa" or "Australia" should under the circumstances more properly follow the "S.," left his entry incomplete for the moment and never subsequently had his difficulty satisfactorily cleared up. The main interest of the correspondence lies, however, as Sir William Herschel points out, in its affording what appears to be an authentic record of "a flowering two-year old plant after 68 years dormancy" of its seed.

Sir William's promise has been fulfilled and this interesting plant has now been added to the collection at Kew.

Botanical Magazine for February. — The plants figured are *Stanhopea peruviana*, Rolfe (t. 8417); *Stranvaesia undulata*, Decne. (t. 8418); *Leptospermum scoparium*, Forst., var. *Nichollii*, Turrill (t. 8419); *Olearia chathamica*, T. Kirk (t. 8420) and *Crassula Barklyi*, N. E. Br. (t. 8421).

Stanhopea peruviana is a handsome Orchid discovered in Peru by Mr. Forget when collecting on behalf of Messrs. Sander & Sons, St. Albans, most nearly allied to the Mexican species *S. Wardii*, Lodd., but with smaller flowers and narrower petals and with, at the same time, a rather different lip. The flowers are fragrant; as in other species of the genus they last only a few days. The subject of the plate was presented by Messrs. Sander & Sons to the Kew collection in 1909 and flowered there for the first time in January 1910.

Stranvaesia undulata is one of the numerous Chinese plants for whose introduction horticulture is indebted to Mr. E. H. Wilson when collecting on behalf of Messrs. J. Veitch & Sons, and the plant from which the material for the figure published was obtained is one that was purchased by Kew from that firm. In Western China there appear to be several fairly well marked forms of *Stranvaesia*, which however differ from each other by characters that when taken individually seem to be of slight importance. The best known of these forms are those described by Decaisne as *S. undulata* and *S. Davidiana*. Even with large suites of specimens it is not difficult to keep these two apart though it seems necessary to treat the plant termed *S. Henryi* by Dr. Diels as only a form of *S. Davidiana*. More recently, however, Dr. Schneider has decided that it is not possible to separate the latter from *S. undulata* and the plant figured certainly goes far towards justifying this conclusion, because as regards foliage it is the original *S. undulata* whereas it has the inflorescences characteristic of *S. Davidiana*. The evanescent character of the petals detracts from its value as a flowering shrub, but as one with ornamental fruit it possesses great merit and owing to its extremely hardy nature it bids fair to take the place of the Pyracanth in places with a cold winter climate. It is easily propagated both by cuttings and from seed.

The *Leptospermum* included in this number only differs from typical *L. scoparium*, a very widely spread and remarkably variable species which is a native both of Australia and of New Zealand, in having petals of a carmine red colour, and in having leaves of the colour of those of the Copper Beech. For its introduction horticulture is indebted to Captain A. A. Dorrien-Smith, who brought it from New Zealand in 1908. To nurserymen in that Colony it is known as *L. Nichollii* and by them is stated to have been first found growing on sand hills north from Christchurch and is believed to have originated as a seedling from a *Leptospermum* with white flowers, itself perhaps only a seedling form, known in New Zealand lists as *L. Chapmanii*. Whatever the precise nature of the form figured may be it is a valuable addition to horticulture, for it is quite hardy and is easily raised from cuttings, while plants so obtained flower when about a year old. The material for the plate was obtained from a plant grown at Kew under glass; when so treated it opens its flowers in April and remains in blossom for

about six weeks. The Kew experience is that in plants under glass the leaves are green; only in plants grown in the open does the foliage here assume a coppery tinge.

Olearia chathamica is another striking New Zealand plant for whose introduction, in 1908, horticulture is again indebted to Captain Dorrien-Smith. This handsome Composite is not, however, met with in New Zealand proper; it is confined to the Chatham Islands, a small gronp lying further to the east, where it grows in compact masses on the cliff edges or scattered about among the upland bogs, along with *O. semidentata*, another and it is said even more handsome member of the same genus. The material for the figure was supplied by the Rev. A. T. Boscawen, to whom it had been given by Capt. Dorrien-Smith and in whose garden at Ludgvan near Marazion it flowered in June, 1911. At Ludgvan it has proved quite hardy and is readily propagated by means of cuttings.

Crassula Barklyi is a curious small species which was first gathered in Little Namaqualand by the late Sir H. Barkly about 1875. The plants figured were, however, some which were presented to Kew in January, 1911, by Professor Pearson of Cape Town; they formed part of a collection made during the Percy Sladen Expedition, led by Professor Pearson, and were found by Mr. Pillans, one of the party, some little distance south-west of Bakhuis.

The Plums of New York.—A copy of this elaborate work,* published by the New York Agricultural Experiment Station, has been presented to the Library by Mr. W. P. Hedrich, who is already favourably known as the author of a similar volume dealing with the American species and varieties of *Vitis*, entitled "The Grapes of New York." The bulk of the present volume is taken up with descriptions of varieties of plums that can be grown in New York State, with notes on their origin, history, characteristics and cultivation. It is of quarto size, runs to 628 pages, and is illustrated by about one hundred finely executed, coloured portraits of the more important varieties of fruit and the flowering sprays of some American species of *Prunus*. The plums derived from the Old World *P. domestica*, L., are still by far the most important in North American gardens, especially in the longer settled States. But numerous varieties have been and are being raised by selection and hybridisation from the North American species. These are of peculiar interest and value because in many parts of the United States, like the Mississippi Valley, the prairie States, and the South generally, European plums will not thrive. The Chinese *Prunus triflora*, Roxb., is also playing an increasingly important part in the fruit industry of the United States, being nearly free from the fungoid pests that attack European varieties. Having been cultivated in the Far East for a long period, the plums of the *triflora* group are in size and quality much in advance of any of purely American derivation. The botanical part of the work is carefully and conscientiously done, and the book as a whole will no doubt long be regarded as the standard one on its subject in the United States.

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* The Plums of New York: Report of the New York Agricultural Experiment Station for the year 1910: II. Albany: J. B. Lyon Company, State Printers: 1911.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 3.] [1912.

XI.—ALCOHOL.

J. H. HOLLAND.

The greatly extended use of alcohol in various industries has suggested that a review of the sources whence it is obtained might be of some value.

Ethyl Alcohol is the intoxicating constituent of all fermented beverages—cider, wine, beer, &c., and when distilled forms the base of all potable spirits, receiving different names according to the substance from which it is distilled—brandy from grapes; whisky from grain—barley, rye, &c.; gin—plain spirit, usually grain, flavoured with "Genevrier" (hence the name Geneva) or Juniper berries (*Juniperus communis*, Linn.); rum from sugar-cane, &c., which in their manufactured condition may be better described as alcoholic beverages. Whilst the substances from which alcohol may be distilled are almost unlimited, those from which it is obtained on a commercial scale are confined to products of a suitable nature, which are available in convenient and sufficiently large quantities. These consist of plants that naturally contain sugar in sufficient proportion—fruits, sugar-cane, beetroot, &c., or starch, which may be converted into sugar by fermentation—potatoes, various kinds of grain, roots, &c.

Methyl Alcohol, Wood Naptha, or Wood Spirit is obtained by the dry or destructive distillation of wood, usually, to make the business profitable, in combination with the production of charcoal, creosote, and various acids. (*See* § (7) Wood, &c.)

The plants or parts of plants producing alcohol here enumerated include the more important, those of local interest, a few that have been suggested as possible sources, and finally the Yeast plant which is of fundamental importance in all alcoholic fermentation, but does not need further mention here.

The sources under consideration may be conveniently divided into (1) Fruits, (2) Roots, Tuberous-roots, and Root-stocks; (3) Grain; (4) Stems; (5) Leaves; (6) Inflorescences; (7) Wood or Woody-substances; (8) Peat.

(23204—6a.) Wt. 118—9. 1125. 3/12. D. & S.

(1) Fruits.

Grape-vine (*Vitis vinifera*, Linn., var.), cultivated in South Europe, North Africa, South Africa, Canary Islands, Syria, United States of America, South America, Australia, &c., for the production of wine, the total production of which is well over 3,000,000,000 gallons annually, the share of France, the largest producer, being well over one-third of this.[1] 12,000,000 gallons approximately are imported annually from all sources into this country.[2] There are many varieties, with white and black fruits. The grape is perhaps the oldest and best known source of potable alcohol—brandy, which may be distilled from any wine, but the very best is that prepared in Cognac, in the Charente Department of France, chiefly from the white grapes (var. "Folle blanche") of that locality. A product of high quality is being obtained in the Piraeus, on the same principle as that employed in Cognac.[3] Brandy is also produced in the United States to the extent of over 4,000,000 gallons a year. It may also be distilled from raisins—one ton will yield an average of about 145 gallons of proof spirit,[4] from currants or currant-grape (*Vitis vinifera*, Linn., var. *corinthiaca*)—about 600 lb. of dried currants yield 100 litres of alcohol[5]—and an inferior quality is obtained from the marc of grapes and the dregs of wine vats. Grape skins to the extent of 6,757,190 gallons were used in Germany during 1908 for distillation purposes.[6] From the stalks and pips of grapes a spirit is distilled, and forms the favourite drink of the people in Smyrna. It is used either plain or flavoured with the gum of the "Mastic" tree (*Pistacia Lentiscus*, Linn.).[7]

The colour of "pale brandy" is due entirely to the oak casks in which it is usually stored, and the rich "brown brandy" is coloured with caramel or burnt sugar. Spurious brandies are merely plain spirit, specially flavoured and coloured—usually grain-spirit sent from England or Germany to France, for preparation and return under cover of a good name. Some useful particulars of "Frauds in the Brandy Trade in France" are given in Diplomatic and Consular Report, Misc. Series, No. 72, 1887, pp. 1–3.

It has been estimated that the average percentage of total sugars calculated as dextrose in grapes is 15·0, and the approximate yield of alcohol from a ton is from 21–22 gallons.[8]

Spirit distilled from the grape is rarely if ever used for industrial purposes, although mention ought to be made here of the alcohol from currants in Greece being used for heating and lighting.[9]

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[1] Blyth, "Wines and Wine making at the Paris Exhib." Journ. Roy. Hort. Soc. xxvi. Dec. 1901, p. 428.
[2] Annual Statement, Trade of the U. Kingdom, i. 1910, p. 233.
[3] *See* Dip. and Cons. Rep. No. 4228, Ann. 1909, p. 8.
[4] Perkins, Journ. Dept. Agric. S. Australia, xiii. 1909, p. 193.
[5] Dip. and Cons. Rep. No. 3556, Ann. 1906, p. 16.
[6] Monthly Cons. and Trade Rep. Washington, No. 339, Dec. 1908, p. 179.
[7] l.c. No. 325, Oct. 1907, p. 95.
[8] Wiley and Sawyer, Farmer's Bull. No. 429, 1911, pp. 11, 12.
[9] Monthly Cons. and Trade Rep. Washington, No. 317, 1907, p. 211.

The following fruits, without reference to importance, may under certain conditions be utilised for distillation.

Apple (*Pyrus Malus*, Linn., var.), containing an average percentage of 12·2 total sugars, capable of yielding about 14 gallons of alcohol per ton.[1] 632,343 gallons of spirit were distilled from apples in the United States during 1905.[2]

Pear (*Pyrus communis*, Linn., var.), average percentage of total sugars, 10·0.[1] This fruit and the apple are used in France where in 1905, 2,274 hectolitres were distilled.[3] It is also distilled in the Caucasus, where the production is subject to variation in proportion to the annual vintage, the loss on which in bad years is said to be made up by this and other fruit spirits.[4]

Peach (*Prunus Persica*, Benth. and Hook., var.), average percentage of total sugars, 7·6.[1]

Cherry (*Prunus Cerasus*, Linn., var.), used in the distillation of "Kirschwasser" in Germany, an important centre of the industry being in the Black Forest; 100 kilos. of cherries yield about 3–4 litres of pure alcohol, or 7-8 litres of "Kirsch" at 55°.[5] In 1908 12,684 gallons of this fruit were used for distillation purposes in Germany.[6] The Cherry is also distilled in the Caucasus, on the same principle as given under Pear.[4]

Plum (*Prunus domestica*, Linn., var.), 64,368 gallons used in Germany during 1908.[6]

Prune (*Prunus domestica*, Linn., var. *Juliana*).

Strawberry Tree (*Arbutus Unedo*, Linn.), a small evergreen tree, native of the Mediterranean region—Southern France, Spain, &c., probably indigenous to Ireland. The berries are made into a wine in Corsica, and alcohol is obtained from them in Italy, where the spirit is sold at 40° proof,[7] and in Zante.[8]

Banana (*Musa sapientum*, Linn.), contains 20–25 per cent. of fermentable material,[9] a high percentage of dextrose (13·8)[1] and therefore a possible source of alcohol, but its value as a food is more than likely to outweigh any recommendation for the production of spirit except from waste material. It is reported that a very good spirit has been obtained from bananas unfit for any other purpose, in Guatemala, the yield being estimated at 4½ litres from each bunch of bananas.[10] "Banana Wine" is of some importance in the Antilles, Barbados, Jamaica, Central Africa, East Africa—Kilimanjaro, Congo region, &c.[11]

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1 Wiley and Sawyer, Farmer's Bull. No. 429, 1911, pp. 11, 12.
2 Wiley, Farmers' Bull. No. 269, 1906, p. 23.
3 Monthly Cons. and Trade Rep. Washington, No. 312, 1906, p. 14.
4 Kew Bull. 1893, p. 224.
5 Spon's Encycl. i. p. 224.
6 Monthly Cons. and Trade Rep. Washington, No. 339, 1908, p. 179.
7 Simmonds, Waste Prod. and Undevel. Subs. p. 213.
8 Morewood, Hist. Ineb. Liq. p. 410.
9 Wiley, U.S. Dept. Agric. Farmers' Bull. No. 268, 1906, p. 15.
10 Journ. d'Agric. Tropicale, ix. 1909, p. 79.
11 Kew Bull. 1894, p. 294.

Date-Palm (*Phœnix dactylifera*, Linn.). The fruits yield a spirit used locally in Syria, Egypt, Nubia,[1] &c. (*see* § (4) Stems).

Carob (*Ceratonia Siliqua*, Linn.). The pods are capable of yielding 18·25 per cent. of spirit, and according to Gennadius,[2] for this purpose in Cyprus finely ground Carobs are soaked in treble the quantity of hot water, and to the sugary liquid thus obtained when somewhat cooled, beer yeast and a little sulphuric acid (2 per 1000) is added. After fermentation the spirit is distilled, but distillation is only profitable when the price of the beans is not higher than 10 francs per 100 kilog. The residue is used as food for cattle and pigs.

Cashew (*Anacardium occidentale*, Linn.). A spirit may be distilled from the juicy fleshy pedicels of the fruit. The Portuguese in Goa apply this spirit externally for the cure of rheumatism, and they regard it as a valuable diuretic.[3] In Mozambique, Portuguese East Africa, there is an area of about 12,000 acres, where the trees grow freely and the distillation of the spirit, subject to heavy taxation by the Portuguese Government, is an industry of some importance. (*See K. B.* 1898, pp. 28–29.) It does not appear that the distillation of Cashew Spirit is anywhere more than of local importance.

Prickly Pear (*Opuntia* spp.), natives of S. America. The fruits of (*Opuntia laevis*, Coult.) native of the S. U. States of America have been found to contain from 6·87 to 11·92 per cent. of sugar.[4] For profitable distillation they should be conveniently obtainable in quantities of at least 10 tons per acre. In Malaga an average crop of fruit from 20 sq. meters is given at 2600 fruits (13 fruits to the kilog.), the average quantity of alcohol obtainable being 8 per cent.[5] Owing to the spiny nature of the fruits both of the spiny and spineless plants, the collection is more or less of a serious difficulty, and in New Mexico, gathering the fruits by hand is said to prevent the industry being worked on a profitable basis.[6] "Colonche" is a fermented drink made from the whole fruit in Mexico; a spirit is sometimes distilled from it. The fermented peelings of the "Tuna," for distillation is said to have proved unsatisfactory, the spirit produced had a bad effect on the natives (causing violent headaches) and they prefer Tequila and other Maguey (*Agave*) products.[7]

Central African or Desert Date (*Balanites aegyptiaca*, Delile). The fruits are used in Nupe, N. Nigeria, to make an intoxicating drink, and an alcoholic liquor is made from them on the Congo.[8]

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[1] Morewood, "Hist. of Inebr. Liquors," pp. 51, 55.
[2] "The Carob Tree," p. 12.
[3] Dymock, Pharm. Journ. [3] vii. 1877, p. 731.
[4] U.S. Dept. Agric. Exp. St. Rec. xxiii. 1910, p. 710 (from New Mexico St. Rep. 1909, pp. 18–21).
[5] Kew Bull. 1888, p. 172.
[6] Journ. Roy. Hort. Soc. xxxvii. Oct., 1911, p. 237 (from "Alcohol from Tunas and other Sources," Hare, Mitchell & Bjerregaard, U.S.A. Exp. St. New Mexico, Bull. No. 72, 1909).
[7] Hare & Griffiths, New Mexico Coll. of Agric. Exp. St. Bull. No. 64, 1907, p. 31.
[8] Kew Bull Add. Series ix. 1908, p. 138.

Pine-apple (*Ananas sativus*, Schult. f.), has been found to contain 11·7 per cent. of dextrose.[1] In the Federated Malay States, wines or champagnes are reported to have been made, but apparently with little success.[2] There seems to have been no attempt made to produce alcohol from Pines, although there must be considerable material going to waste, that might be utilised in this way, in connection with the canning industries.

Mulberry (*Morus nigra*, Linn.). A spirit is distilled from the fruits in the Caucasus, the amount produced during the five years prior to 1893, averaging 65,000 vedros (175,760 gallons). The production is subject to variation in proportion to the annual vintage, the loss on which is said, in bad years to be made up with mulberry spirits.[3] A spirit is said to be sometimes distilled from the fruits of White Mulberry (*Morus alba*, Linn.) in Kashmir.[4]

Jambolana (*Eugenia Jambolana*, Lam.), a large evergreen tree, grown throughout India, Ceylon, Malaya, &c. A spirit is distilled from the fruits in Goa.[4]

(2.) Roots, Tuberous-roots and Rootstocks.

Potato (*Solanum tuberosum*, Linn. var.). The Potato is the most important source of industrial alcohol in Europe. The centre of the industry is in Germany, where the production is fostered by the State, and where it is one of the most important branches of Agriculture.

The varieties grown for distillation are white-fleshed, possessing a high percentage of starch, and good croppers.

Considerable attention has been given to the selection and improvement of suitable varieties in Germany, and those found to best meet the requirements, are "Professor Wohltman"—containing 16·3 per cent. of starch, and yielding 342 bushels of tubers per acre; "Iduna"—16·4 per cent. starch, 284 bus.; "Topaz"—17·3 per cent., 326 bus.; "Sas"—18·3 per cent., 399 bus.; "Leo"—17 per cent., 412 bus.; "Richter's Imperator"—15·4 per cent., 476 bus.; "Silesia"—16·3 per cent., 367 bus.; and "Professor Maercker," containing 14·5 per cent. starch and yielding 428 bus. per acre.[5]

The area under cultivation in Germany in 1909 was 8,212,944 acres giving a total yield of 46,706,252 metric tons of potatoes, equal to 5·68 tons per acre, 5 per cent. it is stated were diseased;[6] in 1910 the area was estimated at 8,142,000 acres producing a crop of 42,770,000 tons or 5·25 tons per acre.[7]

The average price is about 20*s.* per ton, and the yield of alcohol about 25 gallons pure or 44 gallons proof from a ton of potatoes.[8]

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[1] Wiley and Sawyer, U.S. Dept. Agric. Farmers' Bull. No. 429, 1911, p. 11.
[2] Ridley, Agric. Bull. Straits & Fed. Malay St. iii. 1904, p. 40.
[3] Kew Bull. 1893, p. 224.
[4] Watt, "Comm. Prod. India," p. 1046.
[5] Mon. Cons. and Trade Rep. Washington, No. 312, 1906, p. 10.
[6] Journ. Bd. of Agric. xvii. Sept. 1910, p. 502 (from Dip. and Cons. Rep. No. 4521, Ann. 1910, p. 23).
[7] l.c. xvii. Jan. 1911, p. 865.
[8] l.c. xii. May 1905, pp. 105–106.

Another estimate is 1 gallon pure alcohol from 1·26 bushels of potatoes.[1]

The advisability of developing a similar industry in this country has been enquired into by a Committee especially appointed for the purpose, and the conclusions arrived at were, "that in the present agricultural conditions of this country it would not be possible to found a profitable industry."[2] In Ireland the Department of Agriculture has come to somewhat similar conclusions, unless the first cost of the potatoes was less than 29*s*. per ton. The success attending distillation of spirit from the potato in Germany is regarded as being due to favourable taxation, enabling the potato distilleries to compete with the cereal distilleries, the payment of a bounty on alcohol used for methylation, export, or in the manufacture of goods intended for export, the heavy cost of transport from some parts of the Empire to markets, and the consequent low net price realised for potatoes intended for consumption, and the use of a large proportion, when refined as a potable spirit.[3] To these considerations may be added the use of the residue after distillation as food for cattle.

Particulars of the industry as carried on in Germany, prepared by Dr. Rose, H.M. Consul at Stuttgart are given in The Journal of the Board of Agriculture, vol. xi. April 1904, pp. 29–31.

Potatoes are also grown in Prussia—yield 25,630,000 metric tons in 1911 ;[4] in Poland, from whence 11,000,000 gallons of spirit were exported in 1907 to Russia,[5] where also they are grown for purposes of distillation, the cultivation becoming annually of greater importance.[6]

Beet-root (*Beta vulgaris*, Linn. var.). This is the most important source of industrial alcohol in France ; the amount grown for distilleries in 1909 was 49,120 hectares, yielding 19,691,680 metric quintals ; in 1910, 52,410 hectares, yielding 18,995,700 metric quintals : and in 1911, 54,535 hectares with a crop of 13,902,150 metric quintals.[7] More than double this area is grown in the country for the production of sugar, and a certain amount of alcohol may be distilled from refuse, molasses, or from beets containing so low a percentage of sugar (4 per cent. or thereabouts) as to be unprofitable for use in the sugar factories.

The value of other roots mentioned here, lies in the starch content, but that of the beet-root turns on the sugar content, of which they may contain 13–16 per cent., capable of producing about 18 gallons of spirit per ton.[8] Voelcker in 1870 estimated the return from an acre at 20 tons of beet-root yielding 360 gallons of proof spirit and 5 tons of pulp ; the profit on a distillery working a crop of 500 acres being given at £9,000, or nearly double that of a sugar

[1] Mon. Cons. and Trade Rep. Washington, No. 312, 1906, p. 5.
[2] Journ. Bd. of Agric. xii. May 1905, pp. 105–106.
[3] l.c. xi. March 1905, p. 733.
[4] Bd. of Trade Journ. Dec. 7th, 1911, p. 511.
[5] Dip. and Cons. Rep. No. 3988, Ann. 1908, p. 22.
[6] Bd. of Trade Journ. Jan. 12th, 1911, p. 101.
[7] Bd. of Trade Journ. Dec. 14, 1911, p. 562. The accuracy of the figures appears doubtful.
[8] Wiley, U.S. Dept. Agric. Farmers' Bull. No. 268, 1906, p. 30, and Bull. Imp. Inst. 1907, p. 168.

factory working the same crop.[1] A more conservative estimate of the yield of roots per acre is 16 tons.[2]

Fifty years or so ago the cultivation of the "sugar-beet" was strongly recommended in England for the distillation of spirit. The "Silesian" variety was grown with considerable success by Mr. Robert Campbell of Buscot Park, Berkshire, for this purpose, the Savalle Stills (Paris)—famous at that period being employed in the distillation.[3]

Sweet Potato (*Ipomoea Batatas*, Linn.). There are upwards of 50 varieties of this plant. The variety "White Sealy," out of 16 varieties examined in Jamaica, is the best for starch content, containing 30·94 per cent., with a yield of about 7 tons of tubers per acre. In the same set "Fire brass" with pale red tubers, contained the least amount—23·74 per cent. of starch, though it yielded 11 tons of tubers per acre.[4] Experiments in South Carolina go to show that two of the best white varieties are "Southern Queen," yielding 416 bushels per acre, containing in all 4443 lbs. of starch, producing 473·5 gallons of alcohol, and "Brazilian," yielding 450 bushels per acre and containing 4848 lbs. of starch, from which 462·2 gallons of alcohol were produced.[5] Wiley and Sawyer estimate that sweet potatoes containing 25 per cent. of starch will yield approximately 38 gallons of alcohol per ton.[6]

Cassava (*Manihot utilissima*, Pohl.), the bitter Cassava, and (*Manihot palmata*, var. *Aipi*, Muell.-Arg.), the sweet Cassava. The roots have been found to contain 25 per cent. of starch and a ton of roots is suggested as likely to produce about 42 gallons of alcohol.[7] The yield from dried roots has been found to be 59·8 litres per cent. on the starch content, which averages 67 per cent.[8] This is not an established source of alcohol, but other conditions being favourable and remembering that the plant is cultivated more or less all over the tropical world for food and starch, it is not unlikely that the cultivation could be extended in order to make it valuable for the purpose under consideration. The plant is capable of yielding from 5 tons and upwards of roots per acre.

Arrowroot (*Maranta arundinacea*, Linn.). The rhizomes or root-stocks of this plant have been mentioned as a possible source of alcohol. An acre will produce approximately 5–7 tons of rhizomes capable of yielding a ton or more of dried starch.[9] The plant is a native of Central America, Brazil, the West Indies, &c., where it is cultivated for the starch or Arrowroot. It is easily grown and comes to maturity in a few months.

Artichoke (*Helianthus tuberosus*, Linn.). The fermentable matter as laevulose and inulin in the tubers is given as from 16–18 per cent.,

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[1] Voelcker, "Beetroot Distillation," pp. 86, 121.
[2] Inter. Sugar Journ. xiii. 1911, p. 410.
[3] Voelcker, l.c. p. 40.
[4] Cousins, Bull. Dept. Agric. Jamaica, ii. Dec. 1904, p. 277.
[5] U.S. Dept. Agric. Exp. St. Rec. xxi. 1909, p. 432 (from S. Carolina St. Bull. No. 146, pp. 3–21).
[6] Farmers' Bull. No. 429, 1911, p. 20.
[7] l.c. p. 19.
[8] Inter. Sugar Journ. xi. 1909, p. 612.
[9] Kew Bull. 1893, p. 196.

nd with 17 per cent. of fermentable substance a ton is estimated to yield about 25 gallons of alcohol.[1] The Jerusalem Artichoke is a native of N. America; it has been commonly cultivated in this country for two or three centuries as a vegetable. It is also largely grown on the Continent for the same purpose and in Germany to some considerable extent for the production of alcohol.

Mescal Maguey (*Agave* spp.). The species of Agave yielding the "Mescal" or "Tequila" of Mexico are somewhat uncertain. According to Rose,[2] they differ principally in the thinner leaves from those Agaves that yield the "pulque" or fermented beverage of the Mexicans, and which have more fleshy succulent leaves. *Agave atrovirens*, Karwinski, is regarded as the usual source of pulque (q.v.).

The Agaves yielding "Tequila" are recognised as a possible source of industrial alcohol. The spirit is distilled from the root-stock. The distillation is of some considerable importance in Mexico, the chief seat of the industry being the State of Jalisco. The plants take from 7–12 years to mature, and the best liquor is distilled from 12-year-old plants. When harvested they are stripped of all leaves and the rootstocks are carted to the distillery. Six to twelve cart loads or 48 arrobas (1200 lb.) produce approximately one barrel (45 gallons) of Tequila.[3]

Yam (*Dioscorea sativa*, Linn. and *D. alata*, Linn.). Cultivated throughout Tropical Africa, West Indies, &c., for food. There are several varieties, most of which are quite capable of yielding crops equal to the Potato and Sweet Potato, and with these two crops the yam may be classified as of equal value for the production of alcohol. Wiley has estimated the percentage of fermentable matter at from 14–26.[4]

Other root-crops that have been suggested as containing fermentable material suitable for the production of alcohol are Turnip (*Brassica campestris*, Linn. var.), Carrot (*Daucus Carota*, Linn.), Parsnip (*Peucedanum sativum*, Benth. & Hook. f., var.), and Mangold (*Beta vulgaris*, Linn., var.), but as in the case of some of the fruits it is only under special circumstances that they could be profitably utilised. The distillation of Mangolds it may be mentioned was attempted in England—Cirencester, &c.—about 1860, and proved a complete failure, owing it was stated to the low percentage of sugar in the roots—rarely more than 4·5 per cent.—and to the defective distilling apparatus.[5]

Tchirish. The rootstocks of Tchirish (*Asphodelus ramosus*, Linn. and *A. albus*, Willd.), herbaceous plants, both native of S. Europe, have been found to yield a high percentage of alcohol. Samples of spirit obtained from the former were exhibited at the Paris Exhibition in 1855, and of the latter, made in Cagliari, Italy, at the

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[1] Wiley and Sawyer, U.S. Dept. Agric. Farmers' Bull. No. 429, 1911, p. 18.
[2] "Notes on Useful Pl. Mexico" Contr. U.S. Nat. Herb. v. No. 4, 1899, p. 224.
[3] Monthly Cons. and Trade Rep. Washington, No. 328, Jan. 1908, p. 119.
[4] Farmers' Bull., No. 268, 1906, p. 27.
[5] Voelcker, "Beet-Root Distillation," p. 40.

Exhibition of 1862. The Asphodel has also been used for purposes of distillation in Algeria.[1]

The root bark of *Acacia Jacquemontii*, Benth., a bushy thorny shrub of India, is also said to be used in the distillation of spirit.[2]

(3.) Grain.

Barley (*Hordeum vulgare*, Linn.), the principal source of whisky distilled from the malt in this country. In Germany during 1907, 172,201 metric tons were used for distillation.[3] It is also used to some extent in Russia for the purpose; the general crop for the 73 provinces in 1909, amounted to 10,148 tons.[4] Wiley and Sawyer give the starch percentage as 58·9.[5] Barley malt, owing to its high cost, is not advisable as a source of industrial alcohol, but it is a convenient and suitable medium for converting starch of other grain into sugar preparatory to fermentation and distillation.

Rye (*Secale cereale*, Linn.), largely cultivated in N. Europe. In Germany, 1907, there were 103,352 metric tons used for distillation.[6] It is an important source of alcohol in Russia—"Vodka" the national drink being made from it; the crop in 1909 amounted to 22,416 tons.[4] It is largely the "grain-spirit" redistilled to make gin. It is not much used in England, but appears to be of some importance in America where for all purposes in 1910 the total acreage was 2,155,000, yielding 32,088,000 bushels, (31,115,636 Imp. bus.)[4] According to Wiley and Sawyer the grain contains 53·7 per cent. of starch. It is used very largely in distilleries which produce compressed yeast or rye-whisky, sometimes used in the yeast mashes of distilleries, but too expensive to be used as the chief ingredient of the mash and rarely yields over 85 gallons of alcohol per ton.[5] Voelcker gives the yield at 16 cwts. per acre, furnishing 95 gallons of proof spirit.[8]

Maize (*Zea Mays*, Linn., var.), is the principal source of industrial alcohol in the United States of America, where the estimated acreage under corn in 1905 was 94,011,369, giving a yield of 2,707,993,540 bushels or an average of about 28·8 bushels per acre.[9] Maize is also used in Bilbao, Spain, for distillation.[10] Distillers' Corn ("Yellow Dent"), has been found to contain 57·9 per cent. of starch and 2·3 per cent. of sugars. One ton (United States) of grain made up of 1850 lbs. of maize and 150 lbs. of malt, is calculated to yield 100 gallons (or approx. 2·5 gallons per bushel) of alcohol; the grain contains 64 per cent. of starch.[5]

Sorghum, Guinea Corn or Dari (*Sorghum vulgare*, Pers.; *Andropogon Sorghum* var. *vulgaris*, Hack). In Germany, 1907, "dari" (and corn)

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1 Simmonds, "Waste Prod. and Undevel. Substances," p. 228.
2 Agric. Ledger, No. 2, 1902, p. 60.
3 Mon. Cons. and Trade Rep. Washington, No. 339, 1908, p. 179.
4 Bd. of Trade Journ., Dec. 22nd, 1910, pp. 590, 591.
5 Farmers' Bull., No. 429, 1911, pp. 16, 17.
Mon. Cons. and Trade Rep., l.c., p. 179.
7 "Beet-Root Distillation," p. 121.
8 Wiley, U. S. Dept. Agric. Farmers' Bull. No. 268, 1906, p. 18.
9 Dip and Cons. Rep. No. 3590, Ann. 1906, p. 18.

was distilled to the extent of 104,347 metric tons.[1] A spirit is distilled from the grain in Manchuria, under the name of "Kaoliang Whisky," samples of which were exhibited at the Japan-British Exhibition, London, 1910. Kaoliang seeds are used in the manufacture of "Samshu."[2]

Rice (*Oryza sativa*, Linn., var.). From this grain the "Sake" of Japan is made, and much of the "Arrack" of India is distilled. Sake is only a brew, like beer, but it is said to contain a larger percentage of alcohol. "Samshu" is distilled from rice, in Hong Kong, where the spirit forms the basis of several beverages prepared by flavouring with plums, oranges and other fruits.[3]

The spirit possesses a peculiar pungent and disagreeable odour, which makes it unsuitable for certain purposes, but it is less pungent when the husk is removed before fermentation.[4] Wiley gives the percentage of fermentable matter in rice as nearly 78.[5] No other cereal appears to contain so great a percentage as this, but its value as a food in China, the United States, India, Africa, &c., seems to be of greater importance than for the production of alcohol.

Ragi (*Eleusine coracana*, Gaertn.), a grass, native of India, where the seed is an important article of food. A fermented beverage is prepared from the grain, and a spirit is sometimes distilled from it.

(4.) Stems.

Sugar Cane (*Saccharum officinarum*, Linn.). The sugar cane is cultivated more or less throughout the tropics for sugar. It is the source of rum, distilled chiefly from the molasses, the most notable being that prepared in Jamaica, where the production of rum is a leading industry.

Alcohol is also obtained from this plant in Cuba,[6] Salvador, where in 1908 there were 62 distilleries[7]; Colombia[8]; Salaverry, Peru —the spirit exported only to Bolivia[9]—and in Mexico. The cane in Mexico yields 70 per cent. of juice on weight, giving from 9–10 per cent. of alcohol, and the cost per litre of producing 96 per cent. alcohol from sugar-cane juice averages a little more than 1 centimo (½ cent) after the cane is delivered at the mill, which can be done for from 4–6 pesos (about 2–3 dollars) per ton.[10] "Aguardiente" made from cane-sugar is one of the chief distilled drinks of Mexico[11] and in Colima, Mexico, the annual production of spirit is given at 262,000 litres, value (1907) 23 cents per litre.[12]

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[1] Mon. Cons. and Trade Rep. Washington, No. 339, 1908, p. 179.
[2] Dip. and Cons. Rep. Ann. No. 4424, 1910, p. 11.
[3] Col. Rep. Ann. No. 659, 1910, p. 13.
[4] Bell, in Pharm. Journ. [2] xi. 1870, p. 358.
[5] Farmers' Bull. No. 268, 1906, p. 28.
[6] Mon. Cons. and Trade Rep. Washington, No. 311, Aug. 1906, p. 132.
[7] l.c. No. 334, July 1908, p. 81.
[8] l.c. No. 341, 1909, pp. 149–150.
[9] Dip. and Cons. Rep. No. 3635, Ann. 1906, p. 34.
[10] Mon. Cons. and Trade Rep. Washington, No. 332, May 1908, pp. 85–86.
[11] Rose. "Useful Pl. Mexico," Contr. U.S. Nat. Herb. v. No. 4, 1899, p. 224.
[12] Dip. and Cons. Rep. No. 3888, Ann. 1907, p. 28.

A small but interesting local industry exists in San Josi di Talisco, near Sucre, Bolivia, where, in 1905, 1050 cwts. of 90 per cent. alcohol (including perhaps some from other cereals) were distilled from sugar-cane in one distillery, and the out-put from various smaller distilleries amounted to another 1000 cwt. It is claimed that the Talisco alcohol is superior to that of German and Peruvian origin, which occasionally reaches that district; the tins in which the spirit is usually sold contain 37 lbs. net, value wholesale (1906) 24*s*. per tin.[1]

Sugar Corn (*Zea Mays*, Linn.). The stems, according to Wiley and Sawyer,[2] contain from 7–15 per cent. of sugar; the waste stalks amount to about 40 per cent. of the total weight of corn, and are capable of yielding from 6–10 per cent. of alcohol or about 11 gallons to every ton of corn. The season, however, during which these stalks are in a fit condition for the production of alcohol is so limited that it is open to question if it would pay, unless other materials were available to keep the distillery working during the remainder of the year. It seems only possible to use these stalks when freshly cut or at the time when the sweet corn is ready for market, as in curing them for fodder the sugars ferment and are lost.[3] The production of alcohol from the stems is suggested in connection with the corn-canning industry.

Sugar Sorghum (*Sorghum saccharatum*, Moench, var.). Cultivated in N. India, China, Japan and N. America. The stalks are recommended as a likely source of alcohol. 1000 lbs. of the juice of the variety "Colman," containing 14·42 per cent. of sucrose and 1·1 per cent. of reducing sugars, is calculated to yield 12¼ gallons of 180° alcohol, and the production of alcohol from a ton of cleaned stalks may be from 15 to 18 gallons.[4]

Grass Trees or Black Boys (*Xanthorrhoea Preisii*, Endl., and other species). Perennial plants with thick short or arborescent woody stems and leaves in a dense apical tuft. The genus is confined to Australia. The inner part of the stem has been suggested as a source of industrial alcohol, and proposals have been advanced to utilise the trees in Victoria[5] (over 100,000 acres), Queensland[6] and West Australia,[7] where the plants cover large areas. The success of such a venture would, however, be open to question in view of the availability of other and better sources. The present value of the stems lies in the resin or "Grass tree gum" of commerce, which exudes naturally from the bases of the old leaves; used for making spirit varnishes and for staining wood.

Sotol (*Dasyliriontexanum*, Schult). "Sotol" is a spirit similar to "mescal" (*see Agave* spp.) obtained from the crown of this plant. The Sotol plant has been found to yield 16 per cent. of laevulose.[8]

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[1] Dip. and Cons. Rep. No. 3600, Ann. 1906, p. 24.
[2] Farmers' Bull. No. 429, 1911, p. 15.
[3] l.c. No. 268, 1906, p. 33.
[4] l.c. No. 429, 1911, pp. 13, 14.
[5] Bd. of Trade Journ. Nov. 19th, 1908, p. 377.
[6] l.c. May 20th, 1909, p. 399.
[7] Journ. Dept. Agric. W. Australia, 1907, p. 514.
[8] Wiley and Sawyer, U.S. Dept. Agric. Farmers' Bull. No. 429, 1911, p. 11.

The Dasylirions are mostly natives of Mexico, where they grow in comparatively waste dry regions.

Date Palm (*Phoenix dactylifera*, Linn.) and Wild Date (*Phoenix sylvestris*, Roxb.). Sometimes the sap obtained from the stems is distilled into spirit in India, but the former plant is of greater importance for the fruit and the latter for the production of sugar or "Jaggery."

(5.) Leaves.

Utschkui (*Heracleum Sphondylium*, Linn.), an Umbellifer, native of Europe and N. Asia. The petioles of the leaves have been used in the preparation of alcoholic beverages in Russia, Poland, Kamschatka, &c. In Russia a spirit is obtained by fermenting and distilling an infusion of the petioles from which the outer skin has been removed, a necessary condition, as the spirit would otherwise be poisonous. The berries of *Lonicera coerulea*, Linn., or berries of Myrtle (*Myrtus communis*, Linn.), are added to the mash, and the spirit when rectified is said to be more palatable than that of native corn-spirit.[1]

Sisal Hemp or **Henequen** (*Agave rigida*, Mill. var. *sisalana*, Pers.). It has recently been found possible to produce a spirit from the waste fleshy matter of the leaf scraped off in the process of extracting the fibre and from the juice of the leaf. The discovery is due to a resident in Yucatan and some importance is attached to it as an auxiliary to the already important fibre industry.[2]

(6.) Inflorescences.

Palmyra or Black Run Palm (*Borassus flabellifer*, Linn.), native of Tropical Africa; cultivated in India, Burma and Ceylon. From the unopened spathes of this palm a sap is drawn, known in India as "toddy," from which the spirit "arrack" is distilled. According to Watt the tapping does not injure the wood as in the case of the date-palm, since it is only necessary to bruise the flower stalk and to crush the young flower or fruit within, and with this object slices of the spathe are made for several days in succession. An earthen pot into which the sap runs is tied to the end of the stump, and if the juice is to be drunk fresh the pot is coated with lime inside in order to prevent fermentation. The Palmyra continues to yield sap at the rate of three or four quarts a day for four or five months. It begins to yield when about 15 to 20 years old and goes on for about 50 years, but once in three years the operation must be discontinued or the tree would die. The female tree yields about half as much sap again as the male. The juice is richer in sugar than most other palms; it is said that three quarts of juice will make one pound of "jaggery."[3]

Cocoa-nut Palm (*Cocos nucifera*, Linn.), widely distributed in tropical countries near the sea. Yields a sap from the spathe, the collection and preparation of which is done in much the same manner

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[1] Pharm. Journ. [4], xxxiii. 1911, p. 779.
[2] Journ. Roy. Soc. Arts, lx. 1912, p. 420.
[3] "Watt, Comm. Prod. India," p. 171.

as that of *Borassus*. The sap, from which spirit is distilled, is also known as "toddy" in India and "tuba" in the Philippine Islands, in both of which countries the collection of the sap for the distillation of alcohol is of some considerable importance. In the Philippines, the average daily production of "tuba" from one palm is 0·65 litre, and each tree is said to develop about ten inflorescences a year, each one yielding sap for about two months. Healthy trees give from 300–400 litres of sap annually, according to age, being considered at their best when about 40 years old.[1] In India the yield of juice is given at about 12 Madras measures (1½-2 gallons)—seven measures in the morning and five in the evening, and the length of time a tree continues to yield varies from six months to a year in very favourable soil.[2] The average amount of alcohol obtained from the sap is 6·1 per cent. by volume, but some loss is said to occur partly during fermentation and partly during distillation, because of the crude methods employed.[3]

Buri Palm (*Corypha elata*, Roxb.), common in India, Philippine Islands, &c. This palm is capable of yielding alcohol, but as it flowers only once during its life it is of no particular importance, and the yield is estimated at only about 3 per cent.[4]

Gomuti or Sugar Palm (*Arenga saccharifera*, Labill.). A tree 30–40 feet high, native of the Sunda, Molucca and Philippine Islands; cultivated in Malacca, Siam, Cochin China, Java, &c. It flowers when about 10 years old, when "toddy" may be drawn, the yield continuing for approximately two years, at the rate of about 3 quarts a day.[5] "Arrack" is distilled from the sap in Java, the Philippines, &c. This palm also dies when the fruit is ripe or after tapping.

Nipa Palm (*Nipa fruticans*, Wurmb.). A low, branched palm, stem or root-stock stout. Found in the Sunderbunds of India, extending eastwards to the Philippine Islands, and southwards to Malaya, Ceylon, Australia, &c., growing gregariously in swampy regions. This palm is the most important source of alcohol in the Philippines, the only country where it appears to be exploited on a commercial scale for the purpose. The industry gathers importance from the fact that the Nipa succeeds best in swampy land where little else is likely to grow. It is tapped for "tuba" in about the fifth year after planting, the method being on the same principle as that for the Cocoa-nut Palm (*Cocos nucifera*) and other palms mentioned; the flowering or fruiting spadix is cut near the top, a thin slice being removed each day to keep the wound open. The flow continues for about three months. The tree lives for a good number of years, upwards of 50 has been suggested[6] as the probable period. The number of plants per hectare has been estimated at about 2,000 to 2,250, giving a yield per year of 86,862 litres of sap approximately, the average

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[1] Gibbs, Philippine Journ. Science, Chem. Series, vi. June 1911, p. 154.
[2] Dict. Econ. Prod. India, ii. p. 450.
[3] Gibbs, l.c. p. 163.
[4] l.c. p. 178.
[5] Dict. Econ. Prod. India, i. p. 302.
[6] Gibbs, Philippine Journ. Science, Chem. Series, vi. April 1911, p. 116.

daily flow from each tree being 0·579 litre.[1] The yield of alcohol from the sap is given at from 4·1 to 7·5 per cent., and approximately 90,000,000 litres of sap were distilled in the Philippines (1910), producing 9,023,323 litres of proof alcohol.[2]

Sago Palm (*Caryota urens*, Linn.), a handsome palm, common in Tropical Asia and Malaya. A spirit is sometimes distilled from the sap, but this as an industry is of secondary importance to that of fibre ("Kittool") production.

Mahwa (*Bassia latifolia*, Roxb.). A large deciduous tree of India and Burma. In India a spirit called "Madhvi" is distilled from the flowers on an extensive scale. The approximate yield is given at six gallons per cwt. The flowers were tried in England as far back as 1877 for distillation and the refuse for feeding cattle, but although the report was favourable, no further progress seems to have been made. It has been stated that flowers exported from Bombay to France, have, after distillation, been returned to that port in the form of "French Brandy,"[3] but there does not appear to be any trade in them now, and the use for distillation is probably confined to India, or to countries where the tree is abundant.

Pulque Maguey (*Agave atrovirens*, Karw., and other species). The Maguey Agaves are cultivated throughout the mountain region and on the table-lands of Mexico, for the production of "Pulque" a fermented beverage which forms the national drink of the country. Every house it is stated has a few plants growing near it to supply pulque for the family.[4] Propagated by suckers or bulbils, the plants are ready for tapping in from 4–7 years. The flow of sap may continue for upwards of 120 days or until the plant dies, yielding under ordinary conditions from two quarts to a gallon of juice per day.[5] The plants are tapped by cutting out the heart or central portion when the inflorescence is about to burst out and would otherwise develop into flower. This juice has been recommended as a source of industrial alcohol.

(7.) Wood or Woody Substances.

Methyl or Wood Alcohol may be obtained from almost any hard wood. The species generally used for the purpose are Beech (*Fagus sylvatica*, Linn.), Oak (*Quercus* spp.), Thorn (*Crataegus Oxyacantha*, Linn.)—this in Great Britain being regarded as one of the best, though it is not always obtainable in sufficient quantities; Birch (*Betula alba*, Linn.), and Maple (*Acer saccharinum*, Wang.), &c. The value depends largely on the quantity available, convenience, cheapness, and the means of disposing of the by-products —charcoal, acetate of lime, &c. The wood may be subjected to distillation green or seasoned. It has been found that the amount of wood alcohol obtained from a cord of wood [8 ft. × 4 ft. × 4 ft. = 128 cubic ft.] in the two forms of apparatus—"oven" and

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[1] Gibbs, l.c. p. 121.
[2] l.c. p. 128.
[3] Jackson, "Comm. Botany, 19th Century," p. 150.
[4] Rose, "Notes on Useful Pl. Mexico," Contr. U.S. Nat. Herb. v. No. 4, 1899, p. 224.
[5] Mon. Cons. and Trade Rep. Washington, No. 328, 1908, p. 118.

"retort"—is 8 to 10 gallons, together with 45 to 52 bushels of charcoal, and 180 to 225 lbs. of grey acetate of lime; and from "kilns" 4 to 6 gallons of spirit, the same amount of charcoal and 90 to 150 lbs. of acetate of lime.[1]

A cord of yellow-pine wood has been found to yield only about 3 gallons of wood-alcohol and 70 lbs. brown acetate of lime.[2] The Pine woods are of greater value in the production of turpentine.

Hard wood distillation is an established industry in the United States, where in 1906 it is computed 7,871,494 gallons of crude alcohol were obtained from 1,144,896 cords of wood[3]; in Germany and in Sweden it is being obtained from the waste wood, or residual sulphite lyes in the preparation of cellulose; on a growing scale in Canada and Australia, and on a comparatively smaller scale in this country. There is in the Forestry Museum at Kew a collection of the products of distillation of wood, presented by Messrs. Turnbull & Co., Glasgow, one of the few firms in the country engaged in the business on a commercial scale. These are: 1. Wood or Methyl Alcohol; 2. Crude Pyroligneous Acid, Wood Oil, Wood Tar, Acetone, Acetate of Lime, Acetate of Soda, Acetate of Lead (White Sugar of Lead), Acetate of Copper (Verdigris), Acetic Acid, Pyrolignate of Lead (Brown Sugar of Lead); Pyrolignate of Alumina (Red Liquor), Pyrolignate of Iron (Iron Liquor), Charcoal, Ground Charcoal for Gunpowder, Distillers' Charcoal, Ground Charcoal for Foundry purposes, Charcoal for Lawns, Golf Greens, &c. Wood naphtha is also produced at the chemical works of Mr. John Glen, Kilkerran, Maybole. The subject has received some consideration in connection with the Beechwood industry of the Chilterns. The low price, however, offered for the waste material and the uncertainty of a large and continuous supply has prevented the foundation of distilleries for the purpose.[5] The Government has recently (1910) sanctioned the erection of a plant for wood distillation in the Forest of Dean,[6] where the large area, approximately 24,000 acres, of timber at the disposal of the Crown, will doubtless contribute largely to the success of the undertaking, as in view of the high initial cost, it is only under such conditions, that this industry could succeed, whereas the production of ethyl alcohol can, if occasion demands, be more or less secondary to general agricultural work.

Wattle Wood (*Acacia mollissima*, Willd.) has been recommended as a source of methyl alcohol, in Natal, in conjunction with the Wattle bark industry. The limited market for the wood after the bark has been stripped for tanning, has suggested distillation to dispose of it, and some investigations have been made by Lt.-Col. Leuchars[7] with this end in view. Dr. Wirtz (London) states that the wood compares very favourably with other woods generally used in destructive distillation and that it comes quite up to the

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[1] Geer, U.S. Dept. Agric. Forest Service, Circ. No. 114, 1907, pp. 3, 4.
[2] l.c. p. 5.
[3] Circ. No. 121, 1907. U.S. Dept. Agric. Forest Service, pp. 3, 5.
[4] Knowledge, Feb. 1912, p. 74.
[5] Kew Bull. 1911, p. 112.
[6] Trans. Roy. Scottish Arboricultural Soc. xxvi. Jan. 1912, p. 99.
[7] Natal Agric. Journ. x. 1907, pp. 1535–1539.

standard of birch and oak. A distillation test by Messrs. Davis Bros. (Manchester), showed the production as :—

	Value (in England).
Charcoal, 33·2 per cent. ; 6·64 cwts. per ton of wood	£3 0 0 per ton
82 per cent. Acetate of Lime 9·05 per cent. ; 2·03 lbs. per ton of wood	12 0 0 „
Methyl Alcohol, 0·81 per cent. ; 2·15 gals. per ton of wood	0 2 6 per gal.

The tree is a native of Victoria, New South Wales and Tasmania. Introduced to Natal. It grows freely in comparatively poor soil and comes to maturity for the production of bark in from 5–10 years.

Sawdust. A method of treating sawdust with gaseous sulphurous acid to develop the sugar, afterwards fermenting and distilling in the usual way, has recently been devised by Prof. Alex. Classen, Technical High School, Aix-la-Chapelle.[1] This invention has been employed at St. Marcel in the Dept. of Ardeche, France, where one metric ton (2204 pounds) of sawdust yields 100 litres or 27·47 gallons of alcohol, and 20 kilos (42 lb.) of acetic acid. The residue or spent sawdust is pressed into briquettes and used as fuel. It is further stated that the wood alcohol produced by this process can be drunk or used for any other purpose to which pure alcohol is usually put.[2] A factory for the dry distillation of alcohol from sawdust was established at Fredrikstad, Norway, in 1897, the plant erected being capable of dealing with 10,000 tons a year.[3]

(8.) Peat.

Some experiments conducted in Sweden appear likely to prove successful in producing alcohol on a commercial scale from peat. A company has been formed for the purpose of developing the industry, and it is claimed that the price of alcohol made from peat will be less than one-half of the present price of alcohol, and lower than the lowest price of refined petroleum.[4]

On the other hand it is reported that several unsuccessful trials have been made in France (Amiens) to produce alcohol from peat.[5]

In both of these countries the peat-lands are very extensive. Methyl Alcohol is largely used to denature ethyl alcohol, though other substances such as benzol, shellac, camphor, castor oil, turpentine, &c., are sometimes used. The denaturing process varies according to the prescribed regulations and the use to which the mixture is to be put. In France a standard denaturant is 15 litres of wood alcohol, ½ litre of benzine, and 1 gram of malachite green to 100 litres of potable alcohol[6] ; in Germany 2½ litres of a "standard denaturizer" made of 4 parts of wood alcohol, 1 part pyridin, with the addition of oil of lavender or rosemary in the proportion of 50 grams to each litre, for every 100 litres of potable

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[1] Mon. Cons. & Tr. Rep. Washington, No. 300, 1905, pp. 221, 222.
[2] l.c. No. 352, 1910, p. 140.
[3] Dip. & Cons. Rep. No. 2013, Ann., 1899, p. 38.
[4] Mon. Cons. & Tr. Rep. Washington, No. 317, 1907, p. 213.
[5] Dip. & Cons. Rep. No. 3567, Ann., 1906, p. 34.
[6] Mon. Cons. & Trade Rep. Washington, No. 312, 1906, p. 11.

spirit[1]; an alternative method is $1\frac{1}{4}$ litres of the "standard denaturant" and 2 litres of benzol to 100 litres of ethyl alcohol, used for heating, lighting and various manufactures. Various methods are allowed for denaturing, sufficient to prevent drinking, but suitable for various uses in which complete denaturing as above would not be practicable. The process in the United States is 10 gallons wood alcohol, $\frac{1}{2}$ gallon of benzine, to 100 gallons of ethyl alcohol[2]; in England 10 per cent. methyl alcohol, and 3 per cent. benzine,[3] and in the Transvaal the formula is 97·5 rectified spirit, 2·0 wood spirit and 0·5 pyridine.[4]

Other instances might be quoted, but the above go to show that the methods of denaturing are almost universally the same. Alcohol is in most countries an important source of revenue, and the production, denaturisation, disposal and use are all more or less regulated by law.

The chief uses to which the denatured product or "industrial alcohol" is put are heating, lighting, and motive power—converted into gas or as fuel. It is not unusual even now in agricultural operations for alcohol to be spent in working machinery over the same ground which grew the material from which it was developed, and its value will increase in proportion to the improvements made in apparatus and machinery adapted to the uses for the above purposes. Amongst the many manufactures in which alcohol is indispensable may be mentioned varnishes, celluloid, synthetic camphor, gelatine, lanolin, soap, hats, artificial silk, various chemical and pharmaceutical preparations, photographic paper, plates, &c., ink, coal-tar colours, vinegar, smokeless powder, &c.

This paper claims little more than merely to indicate the plants from which alcohol is obtained, and though it probably does not exhaust all the possible sources, it covers the best known.

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[1] l.c. No. 299, Aug. 1905, p. 245.
[2] Mon. Cons. & Trade Rep. Washington, No. 315, 1906, p. 192.
[3] l.c. No. 313, 1906, p. 149.
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XII.—NEW ORCHIDS: DECADE 38.

371. **Pleurothallis repens**, *Rolfe*; affinis *P. Josephensi*, Rodr., sed sepalis lateralibus fere ad apicem connatis et colore florum differt.

Rhizoma repens, gracile, internodiis circiter 1–1·4 cm. longis. *Caules* secundarii graciles, circa 2·5–3 cm. longi. *Folia* elliptico-oblonga, carnosa, apice tridenticulata, 3·5–4·5 cm. longa, 1·2–1·4 cm. lata. *Pedunculi* uniflori, graciles, circiter 1·2 cm. longi. *Bracteae* ovatae, minutae. *Flores* subcarnosi. *Sepalum* posticum oblongum, subacutum, 1·4 cm. longum, 4 mm. latum; sepala lateralia fere ad apicem connata, limbus elliptico-oblongus, profunde concavus, apice bicuspidatus, 1·2 cm. longus. *Petala* lineari-lanceolata, subobtusa, 4 mm. longa. *Labellum* oblongum, obtusum, concavum, scabridum, basi subauriculatum, 4 mm. longum. *Columna* clavata, 3 mm. longa.

S. Brazil.

Found in a clump of *Laelia purpurata*, Lindl., and flowered in the collection of Sir Frederick Wigan, Bart., Clare Lawn, East Sheen, in January, 1904. The sepals and petals are pallid, striped with purple-red, and the rest of the flower reddish brown.

372. **Dendrobium (Ceratobium) Imthurnii**, *Rolfe*; a *D. antennato*, Lindl., caule multo altiore et crassiore, foliis multo latioribus, labello longiore et petalis brevioribus differt.

Caules aggregati, 1–1·25 m. alti, basi 2·5–3 cm. lati, supra attenuati, pluriarticulati, foliosi. *Folia* eiliptico-oblonga, obtusa, valde coriacea, 7–10 cm. longa, 3·5–5 cm. lata. *Racemi* axillares, prope apicem ramorum producti, circiter 35 cm. longi, suberecti, multiflori. *Bracteae* late triangulari-ovatae, acutae, 2–4 mm. longae. *Pedicelli* 4–5 cm. longi. *Flores* mediocres, albi, labelli lobis lateralibus lilacino-lineatis. *Sepalum* oblongo-lanceolatum, acutum, spiraliter semitortum, 2 cm. longum; sepala lateralia similia, basi obliqua, et in mentum triangulare acutum 1 cm. longum extensum. *Petala* subpatentia, linearia, acuta, basi attenuata, supra paululo dilatata et torta, 3–3·5 cm. longa. *Labellum* trilobum, 2·5 cm. longum; lobi laterales oblongi, obtusi, minute crenulati; lobus intermedius obovato-lanceolatus, acutus, minute crenulatus, 1·3 cm. longus, circiter 6 mm. latus; lamellae per discum parallelae 3, prope apicem dilatatae, truncatae et minute crenulatae. *Columna* oblonga, 6 mm. longa.

Solomon Islands. *Sir Everard im Thurn.*

A very robust species, allied to *D. antennatum*, Lindl., to which its flowers bear a considerable resemblance, but far more robust in every respect. It was brought from the Solomon Islands by Sir Everard im Thurn, K.C.M.G., late Governor of Fiji and High Commissioner of the Western Pacific, and flowered at Kew in August, 1911.

373. **Bulbophyllum (Oxysepalae) congestum**, *Rolfe*; a *B. odoratissimo*, Lindl., floribus minoribus et sepalis multo brevioribus differt.

Rhizoma repens, subgracile; internodia 3–5 cm. longa. *Pseudobulbi* oblongi, obscure tetragoni, 2–3 cm. longi, monophylli, basi vaginis ovatis membranaceis obtecti. *Folia* sessilia, oblonga, obtusa, coriacea, 4–7 cm. longa, circiter 1·5 cm. lata. *Scapi* axillares, erecti, 3–6 cm. longi, vaginis ovatis acutis obtecti; inflorescentiae capitatae, 1·2–1·5 cm. latae, multiflorae. *Bracteae* lanceolatae,

acuminatae, 5–7 mm. longae. *Pedicelli* 4–5 mm. longi. *Flores* parvi, albiduli, labello pallide flavo. *Sepala* subpatentia ; posticum ovato-oblongum, apice angustum et subobtusum, basi subconcavum, 3–3·5 mm. longum ; lateralia ovata, apice angusta vel subcaudata et subobtusa, 4–5 cm. longa. *Petala* ovata, subobtusa, circiter 1 mm. longa. *Labellum* recurvum, ovato-oblongum, obtusum, obtuse bicarinatum, circiter 1 mm. longum. *Columna* lata, apice obtuse bidentata.

Burma and S.W. China. Kachin Hills, *Mokum*, and mountain forests to south of Szemao, in the Province of Yunnan, 1220 m. *A. Henry*, 12,291.

Flowered in the Royal Botanic Gardens, Glasnevin, in September, 1910. It is markedly different from *B. odoratissimum*, Lindl., in its smaller flowers, much shorter sepals, and pale yellow, not brown lip, though in habit the two are much alike.

374. **Cirrhopetalum Micholitzii**, *Rolfe ;* a *C. retusiusculo*, Hook. f., floribus minoribus, sepalis lateralibus acutis et aureis differt.

Rhizoma repens, lignosum ; internodia brevia. *Pseudobulbi* ovoidei vel ovoideo-oblongi, 1·5–2·5 cm. longi, vaginis membranaceis venosis obtecti, monophylli. *Folia* oblonga vel lanceolato-oblonga, obtusa, coriacea, basi attenuata, 7–8 cm. longa, 1·5–1·8 cm. lata. *Scapi* graciles, suberecti, circiter 15 cm. longi, vaginis paucis obtecti. *Umbella* 8–12-flora. *Bracteae* lineari-lanceolatae, acuminatae, 5–6 mm. longae. *Pedicelli* 8–9 mm. longi, graciles. *Sepalum* posticum oblongum, truncatum, minutissime denticulatum, 3-nervium, 3 mm. longum, purpureo-striatum et marginatum vel purpureo-punctatum ; sepala lateralia connata, lineari-oblonga, acuta, 2 cm. longa, aurea. *Petala* sepalo postico similia et concoloria. *Labellum* recurvum, lineari-oblongum, obtusum, carnosum, 2 mm. longum. *Columna* lata, 1 mm. longa ; stelidia subulata, acuta, brevia.

Annam. Lang Bian, 1500 m., *Micholitz*.

Flowered at the Royal Botanic Gardens, Glasnevin, and with Messrs. Stuart Low & Co., in October, 1910, The lateral sepals are deep yellow, and the dorsal sepal and petals blotched with dark purple on a pale ground, or in one case the spots were confluent into lines, but identical in other respects.

375. **Polystachya repens**, *Rolfe ;* species distinctissima, minuta, a speciebus adhuc notis rhizomate repente et caulibus brevissimis facile distinguenda.

Rhizoma repens, radices numerosos graciles pubescentes emittens. *Caules* brevissimi, circiter 2 cm. longi, vaginis brevissimis obtecti, apice diphylli. *Folia* sessilia, suborbicularia, apice minute emarginata, coriacea, 4–5 mm. longa. *Scapi* terminales, 4–5 mm. longi, prope apicem vaginis latis brevibus obtecti, uniflori. *Bracteae* late ellipticae, obtusae, 1–5 mm. longae. *Sepalum* posticum oblongo-lineare, subacutum, recurvum, circiter 7 mm. longum ; sepala lateralia similia, paullo breviora, basi in mentum breve subsaccatum extensa. *Petala* oblongo-linearia, acuta, recurva, 6 mm. longa. *Labellum* integrum, ovato-lanceolatum, acutum, recurvum, 2 mm. longum. *Columna* brevissima ; pollinia 4, elliptico-oblonga, visco parco cohaerentia.

Tropical Africa. Uganda, *Brown*.

A minute and very distinct species which flowered in the collection of Sir Trevor Lawrence, Bart., Burford, Dorking, in November, 1911. The creeping habit is remarkable, and apparently marks it as a much reduced member of the group containing *P. superposita*, Reichb. f. The sepals and petals are buff yellow striped with brown, and the lip deep red-brown.

376. **Chondrorhyncha Lipscombiae**, *Rolfe* ; affinis *C. albicanti*, Rolfe, sed foliis longioribus, floribus majoribus et labello subtrilobo differt.

Herba caespitosa. *Folia* arcuata vel suberecta, elongato-lanceolata, acuta, basi conduplicata, supra basin articulata, 8–30 cm. longa, 2–2·5 cm. lata. *Scapi* patentes, graciles, circiter 6–7 cm. longi, vaginis paucis obtecti. *Bracteae* oblongae, obtusae, 1 cm. longae. *Sepala* subpatentia, oblongo-lanceolata, acuta, subconcava, sepalum posticum 2 cm. longum, lateralia 2·5 cm. longa. *Petala* oblongo-lanceolata, acuta, 2 cm. longa. *Labellum* concavum, fere quadratum, subtrilobum, 2·3 cm. longum et latum, basi subsaccatum, apice obcordato-bilobum ; lobi laterales ovato-rhomboidei, subacuti ; crista transversa, membranacea, apice 5–7 dentata. *Columna* late clavata, 1·6 cm. longa.

Panama.

Flowered in the collection of Mrs. Lipscomb, Wilton Grove, Wimbledon, in December, 1911. It was found by her son, Mr. Lancelot Lipscomb, when helping to clear some "bush" for rubber and cocoa planting, and was sent home with a good many others in 1910. The flowers are white, with some light purple veins on the lip.

377. **Gongora Tracyana**, *Rolfe ;* a *G. Scaphephoro*, Reichb. f. et Warscew., floribus duplo minoribus et labelli lobis lateralibus aristatis differt.

Pseudobulbi ovoidei, angulati, 3–5 cm. longi, vaginis ampliatis ovatis vestiti, apice diphylli. *Folia* elliptico-lanceolata, subacuta, trinervia, subcoriacea, lucida, basi attenuata, 20–25 cm. longa, 5–6 cm. lata. *Scapi* penduli, graciles, glabri, 35–45 cm. longi ; racemi 35 cm. longi, laxi, multiflori. *Bracteae* oblongo-lanceolatae, acutae, 8 mm. longae. *Pedicelli* subgraciles, 2·5–3·5 cm. longi, horizontales, apice decurvi. *Sepalum* posticum lanceolatum, acutum, concavum, 1·3 cm. longum, marginibus revolutis ; sepala lateralia reflexa, oblongo-lanceolata, acuta, 1·4 cm. longa, marginibus valde reflexis. *Petala* triangulari-oblongi, falcati, acuti, 2 mm. longi. *Labellum* incurvum, trilobum, 9 mm. longum, basi valde concavum ; lobi laterales basi lati, apice falcato-setiferi, setis incurvis 4 mm. longis ; lobus intermedius ovatus, conduplicatus, subobtusus, 4 mm. longus; callus obovato-oblongus, truncatus, compressus, 2 mm. longus. *Columna* clavata, 1 cm. longa.

Peru. *Kromer*.

Introduced by Mr. H. A. Tracy, Amyand Park Road, Twickenham, and flowered in the collection of Mr. J. S. Bergheim, Belsize Park, N.W., in March, 1911, and shortly afterwards with the importer. The sepals and petals are greenish-yellow barred and blotched with brown, and the lip ivory white, with a few brown lines on the basal half.

378. **Angraecum Andersonii**, *Rolfe;* ab *A. caespitoso*, Rolfe; radicibus crassioribus, labelli limbo late elliptico et obtuso, et calcare supra medium crassiusculo differt.

Caulis brevis, aphyllus, radicibus numerosis flexuosis crassiusculis ad 60 cm. longis interdum ramosis instructus. *Scapi* valde numerosi, erecti, graciles, 3–4 cm. longi, basi vaginis brevissimis instructi, 6–10-flori. *Bracteae* brevissimae, obtusae vel minute apiculatae. *Pedicelli* graciles, 1–1·5 cm. longi. *Flores* breves subglobosi. *Sepalum* posticum late elliptico-oblongum, obtusum, concavum, 3·5 mm. longum; sepala lateralia oblique ovata, obtusa, concava, 4 cm. longa. *Petala* late elliptico-oblonga, obtusa, subconcava, 3·5 cm. longa. *Labellum* integrum, late ellipticum, obtusum, concavum, 2·5 cm. longum. *Calcar* 1 cm. longum, anguste fusiformi-oblongum, obtusum, prope apicem subconstrictum, 1 cm. longum. *Columna* oblonga, 1·5 cm. longa; anthera obcordata, rostrata, rostro ascendente; pollinia subglobosa; stipes linearis; glandula lineari-oblonga, stipite sublongior.

Tropical Africa. Gold Coast, *Anderson*.

A curious leafless species which flowered at the Royal Botanic Garden, Glasnevin, in December, 1911, whence it was sent for determination by Sir F. W. Moore. The flowers are semi-pellucid white, with a broad emerald-green line on the sepals, a green centre to the lip, and a green column.

379. **Physurus validus**, *Rolfe*; *P. roseo*, Lindl., omnino affinis, sed scapo et inflorescentia parce pilosis, bracteis et floribus non roseis differt.

Folia elliptico-lanceolata, acuta, submembranacea, basi attenuata, circiter 13 cm. longa, 3–5 cm. lata. *Scapus* validus; spica elongata, densa, multiflora, circiter 15 cm. longa; rachis parce pilosa. *Bracteae* lineari-lanceolatae, acuminatae, 1–2 cm. longae, glabrae, pallide virides. *Pedicelli* arcuati, parce pilosi, circiter 1 cm. longi. *Flores* parvi, albiduli. *Sepalum* posticum late oblongum, obtusum, 3–4 mm. longum; sepala lateralia linearia, subobtusa, 4–5 mm. longa. *Petala* oblique oblonga, subobtusa, 3–4 cm. longa. *Labellum* 4 mm. longum, basi angustum, apice in limbum lunatum expansum, 4 mm. latum; calcar cylindricum, obtusum, incurvum, 5 mm. longum. *Columna* 3 mm. longa.

Peru.

Flowered in the Royal Botanic Garden, Edinburgh, in January, 1911. It resembles the Brazilian *P. roseus*, Lindl., very closely in habit and floral structure, but from the differently coloured bracts and flowers and the different habitat is probably distinct. There is only a sketch of *P. roseus* in Lindley's Herbarium, the species being described from a specimen in Martius' Herbarium. It is also allied to the Peruvian *P. bifalcis*, Lindl., but has a much stouter denser inflorescence.

380. **Habenaria (Ceratopetala) Dawei**, *Rolfe;* species insignis, a *H. cirrhata*, Lindl., foliis radicalibus amplioribus et sepalis multo latioribus distincta.

Folia radicalia, elliptico-oblonga, subobtusa, membranacea, 15–20 cm. longa, 6–8 cm. lata. *Scapus* validus; racemus circiter 25 cm. longus, circiter 10-florus. *Bracteae* sessiles, lanceolatae, acutae, vel acuminatae, 4–6 cm. longae. *Pedicelli* 7–8 cm. longi. *Sepalum*

posticum ovato-oblongum, subobtusum vel apiculatum, 2 cm. longum, sepala lateralia patentia, obliqua, semiovata, subobtusa vel apiculata, 2 cm. longa. *Petala* profunde bipartita; lobus posticus linearis, falcatus, 2 cm. longus; lobus anticus linearis, arcuatus vel incurvus, circiter 6 cm. longus, crassiusculus. *Labellum* profunde tripartitum; lobi filiformes, apice incurvi; lobi laterales 2·5 cm. longi; lobus intermedius 3 cm. longus; calcar 12–14 cm. longum, basi filiforme, apice crassiusculum. *Anthera* oblonga, 8 mm. longa. *Stigmata* 2 cm. longa, apice subito dilatata et subcompressa; rostelli lobi laterales lineares, 2 cm. longi.

Tropical Africa. Uganda: Budongo Forest; in open grass land, *Dawe*, 1026.

A fine species, of which the radical leaves and the upper part of the scape only were sent.

XIII.—THE ARUNDINARIAS OF THE HILLS OF SIKKIM.

J. S. Gamble.

In the 'Flora of British India,' vol. vii, the following species of the genus *Arundinaria* are mentioned as being found in the hills of Sikkim and British Bhutan, included politically in the British District of Darjeeling and the native State of Sikkim.

No. 5. *A. polystachya*, Kurz, a soft-stemmed rather large-leaved species, collected by Kurz and T. Anderson and apparently scarce.

No. 8. *A. racemosa*, Munro, the most common species, rarely found in flower, except at high elevations and then more or less stunted.

No. 9. *A. Griffithiana*, Munro, a species with thorny nodes, which has apparently only once been collected, viz.: by R. Pantling at Paonggong, 10,000 ft. (1895) on the Bhutan border.

No. 10. *A. Pantlingi*, Gamble, a similar species which may perhaps also be thorny at the nodes, also collected by R. Pantling at Rechi La, 11,000 ft. on the Bhutan border, and by Mr. G. A. Gammie's collector near Jongri in Sikkim.

No. 14. *A. intermedia*, Munro, a small species with long-ciliate leaf sheath and no cross-bars to the leaves, found at comparatively low levels in the outer hills.

No. 15. *A. Hookeriana*, Munro, a handsome rather large species with glaucous green or bluish culms also found in the outer hills at comparatively low levels.

No. 17. *A. aristata*, Gamble, a pretty species of the section *Thamnocalamus*, found growing gregariously in the higher hills and easily recognised in flower by the aristate glumes, and generally by its yellow stems and reddish branchlets.

No. 18. *A. Falconeri*, Gamble, a rather scarce species, found in the forests around Senchul and in various parts of Sikkim, above 7000 ft. It is recognisable by the absence of regular transverse veinlets to the leaves and by the sheathing bracts of the inflorescence.

No. 26. *A. suberecta*, Munro, a species which has not yet been found in flower. It has very narrow leaves and was only once collected in Sikkim, viz., by W. A. Kennedy in 1891.

Among these nine species there is one about which there has been a considerable amount of doubt. It is that described by General Munro as *A. racemosa*; and it undoubtedly consists, as first suggested in the "Bambuseae of British India" and afterwards emphasised by Sir D. Brandis in his 'Indian Trees,' of two forms, a high-level one 2 to 4 ft. in height and a low-level one reaching 12 to 15 ft. and even 30 ft. This low-level form is the plant so common in the woods around the hill station of Darjeeling, used for mat-making, roofing material, fencing and fodder, and known to the Nepalese collectors of fodder for horses as 'Maling.' Naturally, in such places, it is so much cut for fodder that it remains small, but at a little distance away, as on the slopes of Mounts Tonglo and Sandukpho or the Nepal frontier, it grows in dense thickets gregariously and is often found with oaks and rhododendrons, and in places with large yew-trees and trees of *Tsuga Brunoniana*. During a residence, off and on, of about 10 years, as a Forest Officer in Darjeeling, I searched for the flowers constantly and never found them, and others have done the same, as, for instance, Mr. G. A. Gammie who, in a letter quoted at p. 10 of the "Bambuseae of British India," wrote "a plant which, although so abundant round Darjeeling as to be almost exclusively used as fodder for ponies, has never been known to flower there." On the other hand, in a note by Mr. G. H. Cave communicated to me by Mr. W. W. Smith, late Curator of the Herbarium of the Calcutta Botanic Gardens, he says, "my own opinion is that individual specimens of the small bamboo, *A. racemosa*, common from 6000 to 10,000 ft. and not found below 5500 ft., flower at least every third year (possibly it could be found every year), and that the flowering plant though crippled does not necessarily die. The Lepcha collectors and the 'grass cutters' and others confirm this, although most of them say that the flowering plant dies." It seems strange that, if it is the case that it is so often in flower, specimens of the flowers are not to be found in the Herbarium at Kew, nor, I think, in that at Calcutta. The first flowering specimens that I have seen are those which were collected in May, 1904, by Mr. B. B. Osmaston, then Deputy Conservator of the Darjeeling Forests, on the slopes of Mount Tonglo at 9000 ft. He calls it 'sporadic-flowering,' and his specimens are very good and are accompanied by leaves and leaf-sheaths which clearly are those of the low-level form. These collections are probably those referred to by Brandis as mentioned in a Bengal Forest Report. Press of other work prevented my examining these specimens carefully till quite recently, but I have now done so and find that the flowers have characters which differ from those of the high-level form which were those from which Gen. Munro prepared his description. Of the specimens mentioned by Munro at p. 17 of his 'Monograph of the Bambusaceae' only one belongs to the low-level form. It is that collected at Mainom by Sir J. D. Hooker (collection Hook. f. & Th.) at 8000 ft. on Dec. 27, 1848, Vern. '*Pummoon*,' and is in leaf only. The specimen is in the Kew Herbarium, labelled '*Arundinaria spathacea*' and '*A. spathiflora*'; the culms are said to have been 12 ft. high. They have scabrous internodes, glabrous leaves with 4–5 pair of main nerves and are 12–14 cm. long and 1–5 cm. broad; the leaf sheaths with few ciliae at the mouth. Mainom is a conical

peak near the Teesta river, conspicuously visible from Darjeeling. On the label it is called 'Mainamuho,' but Munro evidently had good reason to write 'Mainom,' which is the commonly accepted European spelling of the mountain's name. The plant is quite distinct from *A. spathiflora*, Trin., of the North-western Himalaya.

The high-level form is represented in the Kew Herbarium by some of the other specimens which Gen. Munro has quoted. They are :

(1) that collected by T. Thomson in woods above the Islumbo Pass in Sikkim on Oct. 13, 1857. Munro gives the altitude of the locality as 11,000 ft. It was from stunted plants little more than a foot high and has panicles of 3–4 spikelets, the spikelets being few-flowered and having the empty glumes very small and rather distant below the first flower. The specimen also bears the No. 6738 of the Griffith Collection (Kew Distribution).

(2) that collected by T. Thomson on Aug. 26, 1857, at Birch Hill, Darjeeling, 6000 ft., specimens quite similar to those of (1) and noted as having culms 'pale blue' in colour. This specimen is mounted on the same sheet as (1), and I am obliged to confess that I think there must have been some mistake and that the label, properly belonging to some other plant, has got misplaced and been wrongly affixed to the sheet. Birch Hill is the end of the Darjeeling ridge and is now part of a public park and is a very unlikely locality for the high-level *A. racemosa*.

(3) that collected by Sir J. D. Hooker at Yalloong, 10,000 ft. in Eastern Nepal, Vern. '*Pat-hioo*.' It bears no flower and has slender geniculate branchlets, pubescent leaves up to 10 cm. long and scarcely 1 cm. broad.

These are the chief specimens quoted by Munro, and it seems quite evident that Thomson's Islumbo Pass flowering specimen is the real type of *Arundinaria racemosa*, while at the same time the descriptions of the culms and leaves have been partly taken from Hooker's Mainom leaf specimen, which belongs to the low-level form. Since the publication of Munro's work, the high-level plant has been collected several times by Mr. G. A. Gammie and collectors deputed by the staff of the Calcutta Botanic Garden between 1887 and 1897, on the Singalila Range (the Nepal-Sikkim frontier range) above 10,000 ft., and in various places in Sikkim. When Mr. G. A. Gammie first sent me foliage specimens of this small species, I took it to be something new and gave it a manuscript name, *A. Gammieana* which was the name under which I proposed to describe it in the 'Bambuseae.' I then found I was wrong in supposing it to be distinct and that the specimens really belonged to what Munro had described as *A. racemosa*. This high-level plant has culms 60–120 cm. high and scarcely 1 cm. in diameter at base and smooth, not scabrous as in the low-level form. Both the high-level and low-level species have long rhizomes, the culms arising singly from them, so that they easily spread and grow gregariously over considerable areas. In this manner of growth they agree, so far as is known, only with *A. jaunsarensis*, Gamble of the Western Himalaya, *A. Rolloana*, Gamble of the Naga Hills in Assam and the interesting but doubtful species *A. anceps*, Mitford, which is cultivated in Europe, but of the exact country of whose

origin, though believed to be of the Kumaon Himalaya, nothing is known.

A. racemosa, Munro (which form is not stated), was reported by Mr. W. J. Bean in the *Kew Bulletin* for 1907, p. 230, to have flowered in the Temperate House at Kew in 1899, but specimens are apparently not in the Herbarium.

I have come to the conclusion that the suspicion which I held when writing the 'Bambuseae,' and the 'Manual of Indian Timbers' and which Brandis so strongly confirmed, is well founded, and that the two forms of *A. racemosa*, Munro, are really two different species. The high-level form is clearly the one whose flowers were described by Munro, and the low-level form is that called by Hooker *A. spathacea* and *A. spathiflora*. But it is not *A. spathiflora*, Trin. That is a well-known and distinct species of the Western Himalaya, so that a new name has to be found, and so I propose to call it *A. Maling*. The descriptions of the two species will now have to be revised, and I have consequently drawn up the following :

Arundinaria racemosa, *Munro* in Trans. Linn. Soc. xxvi. (1868) 17. *Species* nana, e rhizomate subterraneo viz 5 mm. crasso culmos graciles per intervalla proferens ; ramulis foliiferis et floriferis ad nodos fasciculatis. *Culmi* erecti, 6–12 dm. longi, radicibus ad basim supra rhizoma muniti et vix 1 cm. diametro, internodiis flavis ad 10 cm. longis 1 cm. diametro teretibus nec scabris ; cataphylla straminea, glabra vel parce ad apices pubescentia, 6–10 cm. longa, 1·5–2 cm. lata, striata, ore parce ciliata et interdum cornuta, laminis anguste subulatis 0·5–1·5 cm. longis scabris ; ramuli teretes, glabri, rufescentes, saepe geniculati. *Folia* tenuia, lineari-lanceolata, in ramulis gracilibus ad 30 cm. longis, apice setaceo-acuminata, basi obtusa vel in petiolum brevem latum attenuata ; 3–10 cm. longa, 5–10 mm. lata ; nervi utrinque 3, minoribus circa 5–7 (5–6 per mm.) interpositis et venulis transversis conspicuis circa 5–6 per mm. ; juniora subtus pilis longis hirsuta, demum glabra ; uno margine laevia, altero scabra ; vaginae striatae, primum pubescentes demum glabrae, membrana brevi terminatae, ore cornutae et ciliis paucis longis fimbriatae ; ligula brevis, puberula. *Panicula* simplex, racemosa ; ad basim et aliquando fere ad spiculas bracteis vaginantibus longis striatis suffulta ; rhachis glabra ; spiculae 3–6, 3–5 cm. longae, pedicellis angulatis filiformibus 1–3 cm. longis ; flores in spiculis 4–6, distichi, alterni, addito interdum ultimo vacuo ; rhachillae clavatae, pubescentes, 5–6 mm. longae. *Glumae* I. et II. (vacuae) valde variabiles, minimae, acuminatae, 2–3·5 mm. longae, infra florem primum saepissime 3–4 mm. distantes ; gluma III. (florens) ovato-acuminata, pubescens, scabride-aristata, nervis 7–9 conspicuis, 9–10 mm. longa ; IV. (palea) florenti aequalis vel brevior, apice 2-mucronata, carinis apices versus extus ciliatis, nervis obscuris. *Lodiculae* 3, ovato-lanceolatae, ciliatae, basi nervosae, 1·5–2 mm. longae. *Antherae* purpureae, 5 mm. longae, apice bifidae. *Ovarium* ovoideum ; stylo brevi ; stigmatibus 3 brevibus papillosis. *Caryopsis* oblongus, apice attenuatus, sulco longitudinali notatus. Gamble in Ann. R. Bot. Gard. Calc. vii. 9 (*in part*), t. 8, figs. 2, 5 to 13, and in Hook. f. Fl. Brit. Ind. vii. 379 (*in part*) ; Brandis Ind. Trees 664 (high-level form). *Arundinaria Gammieana*, Gamble MS.

Eastern Nepal: at Yalloong, 10,000 ft., Vern. 'Pat-hioo,' *J. D. Hooker* (leaves only). Sikkim: woods above Islumbo Pass, *T. Thomson*, Oct. 13, 1857 (*Griffith* K.D. 6738, flowers); at Singalilah, 10,000 ft., June 1887 *Dr. King's Collector* (flowers); at Saburkum 10,000 ft., March 1889, Vern. 'Miknu' *Lepcha*, 'Mheem' *Bhutia*, *G. A. Gammie's Collector* (culms and leaves); at Phalut, 10,000 ft., May 1890, *King's Collector* (culms, leaves and flowers); at Phalut 11,500 ft., May 1892, Vern. 'Miknu' *Lepcha*, *G. A. Gammie* (culms, leaves and flowers); at Jongri 12,000 ft., July 1897, *Phul Sing* for *G. A. Gammie* 10,344 (leaves); at Phalut 12,000 ft. do. do. 10,348 (flowers and leaves).

Some of the specimens above quoted are in the Herbarium at Kew, the rest of them, communicated by the Calcutta Botanic Garden or by Mr. Gammie, in my own.

Arundinaria Maling, *Gamble* **sp. nov.**

Frutex erectus, 3–9 m. altus, e rhizomate crasso subterraneo culmos singulos per intervalla proferens. *Culmi* graciles, erecti, fistulosi, parietibus 5 mm. diametro, internodiis superne scabris, 30–40 cm. longis, 2–3 cm. diametro; cataphylla straminea, chartaceo-coriacea, eximie striata, extus sparsim fulvo-hispida, marginibus ciliatis, ad 30 cm. longa et 10 cm. lata, supra attenuata, ore 1–2 cm. lato auriculata, et ciliis longis rigidis patentibus munita; lamina subulata, 6–7 cm. longa, erecta vel reflexa, intus scabra; ligula 1 cm. longa, eximie fimbriata. *Folia* chartacea, lineari-lanceolata, apice setaceo-acuminata, basi in petiolum brevem attenuata, utroque latere glabra, subtus glaucescentia; marginibus minutissime scabra; 5–18 cm. longa, 0·8–2 cm. lata; nervi utrinque 3, minoribus circa 6–9 (5–6 per mm.) interpositis et venulis transversis conspicuis, tessellatis, circa 3–4 per mm.; vaginae striatae, ore ciliato excepto glabrae et ibi ciliis paucis longis rigidis, circa 3–5, munitae; ligula brevis, truncata, pubescens. *Panicula* decomposita, 10 cm. longa, ad basim bracteis spathaceis superne foliaceis vaginantibus suffulta; rhachis glabra, angulata; rami et pedicelli filiformes, sinuati, 1–2 cm. longi; spiculae 10-20, 3·5 cm. longae; flores in spiculis 7–9, distichi, alterni, ultimo vacuo; rhachillae clavatae, curvatae, intus complanatae, pubescentes et ciliatae, 5–6 mm. longae. *Glumae* I. et II. (vacuae) florem inferum amplectentes, ovatae, scabride setaceo-acuminatae, I. enervis 2–4 mm. longa, II. 5-nervis 7–9 mm. longa; gluma III. (florens) etiam ovata, et scabride setaceo-acuminata, 7–9-nervis et nervulis transversalibus, 1–1·2 cm. longa; IV. (palea) apice bifida, ad carinas ciliata, intra carinas 2–3-nervis et nervulis paucis transversalibus, ad latera 1–2-nervis, 7–8 mm. longa. *Lodiculae* 3 ovatae, obtuse acutae, ciliatae, basi nervosae, 2–2·5 mm. longae. *Antherae* luteae, 5–6 mm. longae, apice bifidae. *Ovarium* ovoideum, stylo brevi gracili et stigmatibus 3 longis plumosis. *Caryopsis* nondum visa. *A. racemosa*, Munro in Trans. Linn. Soc. xxvi. 17 (*in small part only*); Gamble in Ann. R. Bot. Gard. Calc. vii. 9 (*in part*), t. 8 figs. 1, 3, 4, 14, and in Hook. f. Fl. Brit. Ind. vii. 379 (*in part*); Brandis Ind. Trees 664 (low-level form).

Sikkim: Mount Tonglo, 9000 ft., May 23 1904, Vern. 'Maling' *Nep.*, *B. B. Osmaston* (flowers and leaves); at Mainom,

8000 ft., Dec. 27, 1848, Vern. 'Pummoon' *Lepcha*, *Hook. f. & Th.* (leaves); Vern. 'Phyong' *Bhutia*, Oct. 5 1868, *Kurz* (leaves); also at various other places in British Sikkim, *G. A. Gammie*, *J. S. Gamble* and others, in leaf only.

Thus, it will be seen that the number of Sikkim species of the genus *Arundinaria* must be raised to 10. *A. Maling* undoubtedly comes very near to *A. Pantlingi*, and at one time I thought they might be identical, but the latter species has long loose much branched panicles, longer and narrower spikelets, glumes with more conspicuous awns and strongly ciliate leaf sheaths, while in *A. Maling* the panicles are quite short and compact, the spikelets broad, the glumes less awned and the leaf sheaths glabrous at the margins. I have made an attempt to give in an analytical key a guide to the ten Sikkim species, which may perhaps be of use to botanists in the Eastern Himalaya. I would have liked to base the key chiefly or even wholly upon the leaves, but the difficulty is that the leaves are so variable according to whether they are taken from upper branches or from new shoots and so on, that mere size goes for very little. In some species the culm sheaths afford excellent characters, but they are not always available.

Leaves with conspicuous transverse veinlets.
- Inflorescence branches without conspicuous broad sheathing bracts:
  - Dwarf plants reaching scarcely 4 ft. in height; spikelets few, rarely 6, in a short raceme with narrow sheaths below ... ... 1. *A. racemosa.*
  - Culms tall, reaching 12 or even sometimes 30 ft. in height; spikelets many, more or less paniculate—
    - Panicles compact, terminal, about 4 in. long with 10–20 spikelets ... ... 2. *A. Maling.*
    - Panicles loose, terminal and axillary with many spikelets—
      - Culm-nodes without spines ... 3. *A. Pantlingi.*
      - Culm-nodes spinous ... 4. *A. Griffithiana.*
- Inflorescence branches with conspicuous broad sheathing bracts, each enclosing 3–5 spikelets with conspicuously aristate glumes ... ... 5. *A. aristata.*

Leaves with no or very few transverse veinlets—
- Inflorescence branches without sheathing bracts—
  - Culms tall, bluish-green; leaves rather large; spikelets of only 1 flower ... ... 6. *A. Hookeriana.*
  - Culms rather small—
    - Leaves soft, rather large; spikelets 4- to 6-flowered in a tall close panicle; leaf sheaths not ciliate 7. *A. polystachya.*
    - Leaves stiff, moderately large; spikelets 3–5-flowered in slender panicles; leaf sheaths ciliate 8. *A. intermedia.*
- Inflorescence branches with sheathing bracts; spikelets 2–4-flowered; leaves soft ... ... 9. *A. Falconeri.*

Inflorescence not known; leaves very narrow, linear 10. *A. suberecta.*

XIV.—NIGERIAN FUNGI.

E. M. Wakefield.

In the following list particulars are given of an interesting collection of fungi made in Northern Nigeria by Dr. J. W. Scott Macfie, and forwarded to Kew for identification by Mr. Carleton Rea, Hon. Sec. of the British Mycological Society. One new species, *Metraria brevipes*, is described, and a very rare and beautiful fungus, *Hexagonia niam-niamensis*, was also represented in the collection.

The numbers in brackets are the field numbers given by Dr. Macfie.

Agaricaceae.

Omphalia reflexa, *Bres.* in Bull. Soc. Myc. Fr. Vol. vi (1890), p. xxxiv.

A single specimen, having the pileus remarkably lobed at the margin, but otherwise agreeing exactly with the type description and figure.

On the ground, Baro, Sept. 11, 1910. (5E.)

Lentinus Zeyheri, *Berk.*, in Hook. Lond. Journ. of Bot., vol. ii, 1843, p. 514.

L. capronatus, Berk. l.c. p. 513.

Doka to Katai, Dec. 11, 1910.

Lentinus flavidus, *Mass.*, in Kew Bull. 1901, p. 163.

Possibly the same as *L. Tuber-regium*, Fr.

On sandy ground, Baro, Sept. 12, 1910. (6A.)

Lenzites applanata, *Fr.*, Epicr. p. 404.

Syst. Myc. i, p. 335, *L. Palisoti*, Fr., *Daedalea amanitoides*, Pal., Fl. Ow. t. 25.

Ayangba, Jan. 11, 1911; Kurumculya to Kwakow, Dec. 5, 1910; Dekina, Jan. 12, 1911; Zungeru, Mar. 2, 1911.

Schizophyllum commune, *Fr.*, Syst. Myc. i, p. 333.

On logs; Wooding station, 22 miles from Baro, on the Baro-Minna line, Sept. 3, 1910. (4E in part); Baro, Sept. 11, 1910. (5F); Kogin Seratin Pawa, Dec. 8, 1910: Zungeru, Feb. 20, 1911.

Metraria brevipes, *Wakefield*, sp. nov.

Pileus e globoso expansus, fere planus, pallide umbrinus, squamis crassis obscurioribus ornatus, 5 cm. latus, margine radiato-striatus; stipes concolor, basi incrassatus, 5 cm. longus, usque ad 2 cm. crassus, glaber, primo farctus dein fistulosus; annulus crassus, pendens; lamellae confertae, postice angustiores, e roseo fulvescentes, liberae vel leviter adnexae; sporae roseae, ellipsoideae, lateraliter apiculatae, 9–10 × 7–7·5μ.

No volva is present on the specimens forwarded, but its existence is inferred from the smooth, blunt base of the stem, and the appearance of the scales on the pileus.

On the ground, Baro, Sept. 13, 1910. (6B.)

Panaeolus fimicola, *Fr.*, Syst. Myc. i, p. 301.

On horse-dung, Minna, Aug. 22, 1910.

Psathyrella disseminata, *Pers.*, Syn. p. 403. Fr. Syst. Myc. i, p. 305.

On wood; Minna, Sept. 23, 1910. (7A); Wooding station, 22 miles from Baro, on the Baro-Minna line, Sept. 3, 1910. (4E in part.)

Polyporaceae.

Polyporus Tricholoma, *Mont.*, in Ann. sc. nat., 2 sér., viii, 1837, p. 365, and in R. de la Sagra, Hist. Cuba, p. 411, t. 17, f. 1.

Known from Cuba, Central and S. America, and Australia, but not previously from Africa. The African specimens have the stem slightly thickened at the base, but do not appear to be specifically distinct.

Baro, Sept. 24, 1910. (6E.)

Polyporus Hollandii, *Mass.* in Kew Bull. 1901, p. 163.

Originally described from a single specimen sent to Kew from Old Calabar. The specimen of which Dr. Macfie forwarded a portion was evidently much larger, the dimensions given being :— length, 11½ in., breadth, 9 in., maximum thickness, 5 in.

On a stump, Zungeru, April 10, 1911.

Fomes lucidus, *Fr.*, Nov. Symb. p. 61. Syst. Myc. i, p. 353.

Both the typical form and the yellow, unpolished variety which appears to be common in Africa were received. The latter has been sometimes referred to the American species, *F. Curtisii*, Berk., but it differs from this in having dark brown, not pale flesh.

On stumps ; Katonkarifi, Dec. 26, 1910 ; Zungeru, Mar. 2, 1911, &c.

Fomes ligneus, *Cke.* in Grev. vol. xiii, p. 119, 1884.

Ankpa to Lafia (Bassa), Jan. 8, 1910.

Fomes australis, *Fr.*, El, p. 108.

i. No locality given ; ii. Ankpa, Jan. 7, 1911.

Polystictus xanthopus, *Fr.*, Obs. 2, p. 255.

On trees, between Evua and Deni, Dec. 24, 1910 ; Lafia to Ogumi (Bassa), Jan. 10, 1911.

Polystictus Holstii, *P. Henn.*, Pilz. Ostafr., p. 57, in Engler, Die Pflanzenwelt Ostafr.

On trees ; Zungeru, Feb. 20, 1911 ; Kurumculya to Kwakow, Dec. 5, 1910.

Polystictus albo-cervinus, *Berk.* in Hook. Journ. 1856, p. 234. Dec. n. 583.

Originally described from Brazil, but appears to be fairly common in Africa.

On a tree, Agwacha to Oda (Bassa), Jan. 5, 1911.

Polystictus sanguineus, *Mey.*, Esseq. p. 304. *Boletus sanguineus*, Linn. Sp, Pl. ii, p. 1646.

On trees, Ogusw (Nassarawa), Dec. 30, 1910 ; Ankpa to Lafia (Bassa), Jan. 8, 1910 ; 20 miles from Baro, on the B.K.R. line, Sept. 3, 1910 ; Baro, Sept. 11, 1910. (5D.)

Polystictus leoninus, *Kl.* in Linnaea viii, p. 486.

Kurumculya to Kwakow, Dec. 5, 1910 ; 20 miles from Baro, on the B.K.R. line, Sept. 3, 1910 ; 22 miles from Baro, on the Baro-Minna line, Sept. 3, 1910.

Polystictus Persoonii, *Fr.* in Cooke, Praec. n. 850, in Grev. vol. xiv, p. 85.

Kogin Seratin Pawa, Dec. 8, 1910.

Polystictus lanatus, *Fr.*, Epicr. p. 490.

On trees; between Dogu and Wopa, Gurara river, Dec. 20, 1910.

Polystictus occidentalis, *Kl.* in Linnaea viii, p. 486.

22 miles from Baro, on the Baro-Minna line. Sept. 3, 1910; (4E in part); Aiya gwa or Aiyamba, Jan. 11, 1911; Kurumculya to Kwakow, Dec. 5, 1910.

Polystictus membranaceus, *Berk.*, Fung. Brit. Mus. p. 378, tab. X, fig. 7.

Between Mama and Evua by Gurara river, Dec. 23, 1910.

Trametes Hystrix, *Cke.* in Grevillea ix, p. 98.

Zungeru, April, 1911.

Trametes cingulatus, *Berk.*, Dec. n. 441.

A common and variable plant in Africa, Australia and the East. According to Mr. C. G. Lloyd, *Trametes picta*, Berk., *Polystictus albidus*, Mass., and *Polyporus argentatus*, Cke, are synonyms.

On trees by the wayside, Ankpa to Lafia (Bassa), Jan. 8, 1910; between Kogin Seratin Pawa and Doka, Nov. 30, 1910; Doka to Katai, Dec. 1, 1910.

Trametes ochroleuca, *Lév.*, in Ann. sc. nat., 3 sér. v, 1846, p. 145.

The Trametes form of the polymorphic *Sistotrema ochroleucum*, Lév. (Lloyd, Syn. Hex., p. 31.)

Abaji Kolo (Bassa), Jan. 3, 1910; Ankpa to Lafia (Bassa), Jan. 8, 1910.

Hexagonia Klotzschii, *Berk.*, Exot. Fungi p. 383, n. 2.

Apparently a common plant in Africa, but confined to that continent. According to Lloyd (Syn. Hex. p. 7), *H. Klotzschii* is a synonym of *H. hirta*, Pal., *H. crinigera*, Fr., and *Trametes crassa*, Lév.

On trees, between Dogu and Wopa (Gurara river), Dec. 20, 1910.

Hexagonia discopoda, *Pat. et Har.* in Bull. Soc. Myc. Fr. Vol. ix, 1893, p. 209. Probably the same as *H. tricolor*, Fr., of which no specimen is known (Lloyd, Syn. Hex. p. 26).

Between Evua and Deni (Gurara river), Dec. 24, 1910; Kurumculya to Kwakow, Dec. 5, 1910.

Hexagonia niam-niamensis, *P. Henn.* in Engl. Jahrb. xiv, p. 348.

This is the most interesting plant of the whole collection. It is a beautiful *Hexagonia* with large pores, quite distinct from any other known species, and has previously been known only from a single specimen, which is at Berlin. Dr. Macfie found two good specimens, growing on bamboo.

Kurumculya to Kwakow, Dec. 5, 1910.

Thelephoraceae.

Stereum elegans, *Mey.*, Esseq. p. 305, Fr. Epicr. p. 545.

Minna, Oct. 5, 1910. (7B.)

Clavariaceae.

Pterula capillaris, *Lév.* in Ann. sc. nat., 3 sér., ii, 1844, p. 208.

Baro, Sept. 24, 1910. On grass of an old roll used by the natives for placing under a load on the head.

Spores 11–12 × 6–7μ, most 12 × 7, ellipsoid, apiculate at base.

Tremellaceae.

Guepinia spathularia, *Fr.*, Elench. ii, p. 32.
On a stump, Baro, Sept. 24, 1910. (6D.)

Sphaeriaceae.

Xylaria polymorpha, *Grev.*, Flor. Edin. p. 35.
Zungeru, Mar. 2, 1911.

Xylaria grammica, *Mont.* in Ann. sc. nat., 2 sér., xiii, 1840, p. 341. t. 9, f. 1.
Aiya gwa or Aiyamba, Jan. 11, 1911.

Poronia ustorum, *Pat.* in Bull. Soc. Myc. Fr. iii, p. 175.
The Nigerian specimens have spores 10–12 × 5–6μ, (most 11 × 6μ), instead of 8–10 × 4–5μ, the measurements given by Patouillard. In all other respects, however, they agree with the description of *P. ustorum*.
On grass stubble, Baro, Sept. 10, 1910.

Daldinia concentrica, *Ces. et De Not.*, Schema Sf. it. in Comm. Soc. Critt. It., i., p. 198.
On stumps; Minna, Aug. 18, 1910. (3C); Wooding station, 22 miles from Baro, on the Baro-Minna line, Sept. 3, 1910. (4E in part.)

Myxomycetes.

Stemonitis splendens, *Rost.*, Mon. p. 195.
On wood; 22 miles from Baro, on the Baro-Minna line, Sept. 3, 1910. (4E in part.)

XV.—CONTRIBUTIONS TO THE FLORA OF SIAM.

Additamenta.

Dasymaschalon sootepense, *Craib* [Anonaceae-Unoneae]; a *D. Blumei*, Finet et Gagnep., foliis tenuioribus longius petiolatis, fructuum articulis multo longioribus recedit.

Arbuscula ad 7·5 m. alta (ex *Kerr*); ramuli primo pilosuli, mox glabri vel subglabri, cortice brunneo vel fusco-brunneo irregulariter striato obtecti. *Folia* oblanceolato-oblonga vel oblonga, apice breviter acuminata, acuta, basi late cuneata vel subrotundata, 9–19·8 cm. longa, 2·5–6 cm. lata, tenuiter chartacea, supra matura glabra, subtus parcissime appresse setulosa, glauca, nervis lateralibus utrinque 9–10 intra marginem arcuatis cum costa supra leviter impressis subtus prominentibus; petioli 1 cm. longitudinis vix attingentes, supra sulcati, indumento ramulorum. *Flores* plerumque axillares, solitarii, pedicellis apicem versus leviter incrassatis ad 1·5 cm. longis basi breviter bracteatis et paullo supra basin minute bracteolatis suffulti. *Sepala* 3, deltoidea, acuta, 3 mm. longa, 1·5 mm. lata, extra appresse ferrugineo-pubescentia. *Petala* ad 4 cm. longa et 1·5 cm. lata, utrinque sed intra parcius appresse pilosula. *Fructus* lomentaceus, ad 6 cm. longus, pedicello circiter 1 cm. longo suffultus, rugulosus, parce appresse pilosulus; semina straminea, 1·8 cm. longa, vix 5 mm. diametro, hilo inferiore.

Chiengmai, in evergreen jungle on Doi Sootep, 1050–1260 m., *Kerr*, 1364, 1777.

Platymitra siamensis, *Craib* [Anonaceae-Mitrephoreae]; a *P. macrocarpa*, Boerl., foliis longioribus angustioribus basi cuneatis vel subobtusis, pedicellis crassioribus, antheris filamentis longioribus, bacca ovoidea, seminibus vix 2 cm. longis 1 cm. crassis differt.

Arbor alta (ex *Kerr*), inflorescentia excepta glabra; ramuli cortice brunneo vel fusco-brunneo lenticellato irregulariter striato obtecti. *Folia* lanceolata, apice acuminata, obtusiuscula, basi cuneata, subobtusa, 5–13 cm. longa, 1·5–2·5 cm. lata, rigide chartacea, supra nitida, subtus subnitida, nervis lateralibus utrinque circiter 12 intra marginem arcuatis supra conspicuis subtus prominulis; petioli circiter 5 mm. longi, supra canaliculati. *Flores* fasciculati, fasciculis ex axillis foliorum delapsorum plerumque ortis; alabastra depresso-globosa, appresse pubescentia; pedicelli 1 cm. longi, crassiusculi, basi breviter bracteati, apicem versus bracteola parva instructi. *Calyx* 1·5 mm. altus, extra ferrugineo-pilosulus, lobis 3 rotundatis. *Petala* 3 exteriora valvata, satis crassa, circiter 3 mm. longa, 3 mm. lata, extra appresse breviter ferrugineo-pubescentia, intra glabra, 3 interiora apice valvata, basi aperta extra breviter appresse pubescentia. *Stamina* circiter 20. *Ovaria* 2, albo-hirsuta. *Bacca* ovoidea, circiter 7 cm. longa, 5 cm. diametro; semina 8, 1·8 cm. longa.

Sriracha, Nawng Kai Ploi, in evergreen jungle, 90 m., *Kerr*, 2125. Siamese name, Hŭm Chang (ex *Kerr*).

There are no open flowers in the specimens received and the above description of the flowers is taken from buds.

Miliusa cuneata, *Craib* [Anonaceae-Miliuseae]; a *M. sinensi*, Finet et Gagnep., foliis longioribus basi cuneatis, ovulis solitariis recedit.

Suffrutex ad 4·5 cm. altus (ex *Kerr*); ramuli primo fulvo-tomentelli, mox puberuli, ad 4 mm. diametro, cortice brunneo lenticellato. *Folia* oblanceolata vel late oblanceolata, apice acuminata, acuta vel obtusa, basi cuneata, 4–14 cm. longa, 1·5–4·4 cm. lata, chartacea, supra costa tantum breviter pubescentia, subtus primo costa densius fulvo-pubescentia, cetera pilosula, matura molliter puberula, nervis lateralibus utrinque 12–15 intra marginem arcuatis pagina utraque subconspicuis; petioli 3–4 mm. longi, indumento ramulorum. *Inflorescentia* pauciflora, plerumque ex axillis foliorum delapsorum; pedicelli ad 2·7 cm. longi, sub anthesin graciles, postea paullo incrassati, basi minute bracteati et circiter 7 mm. e basi minute bracteolati. *Sepala* 3, deltoidea vel late lanceolata, acuta, vix 2 mm. longa, ad 1·25 mm. lata, breviter ciliata, pauperrime pubescentia. *Petala* exteriora sepalis conformia, circiter 3·5 mm. longa, 0·75 mm. lata, indumento ut sepalis, interiora viridia (ex *Kerr*), 1·2 cm. longa, 6 mm. lata, concava, basi parum sacciformia, intra puberula. *Stamina* circiter 6-seriata, filamentis brevibus. *Ovaria* parce pubescentia, 1·25 mm. alta, stylo 0·75 mm. longo; ovula solitaria, basilaria.

Chiengmai, in evergreen jungle on Doi Sootep, 900 m., *Kerr*, 1837.

Xylosma brachystachys, *Craib* [Bixaceae-Flacourtieae]; a *X. longifolia*, Clos, foliorum nervis paucioribus, inflorescentia reducta recedit.

Suffrutex sarmentosus, dioicus, glaber, in exemplo uno tantum spina solitaria axillari 4 mm. longa visa ; ramuli graciles, cortice primo pallide brunneo mox cinereo pauci-lenticellato obtecti. *Folia* plerumque oblonga vel oblongo-oblanceolata, apice acuminata, plerumque caudatim, mucronulata, basi cuneata vel late cuneata, 3·5–14·5 cm. longa, 1·2–5 cm. lata, rigide chartacea, nervis lateralibus utrinque 5–7 iis basalibus obliquis subrectis exceptis arcuatis supra conspicuis, subtus cum costa prominentibus, nervis transversis uti lineis subparallelis pagina utraque conspicuis, margine, basi acumineque exceptis, serrata ; petioli ad 4 mm. longi, supra canaliculati, sicco pallide virides. *Inflorescentia* ♂ petiolos subaequans vel paullo superans ; pedicelli 1·5 mm. longi, glabri, basi parvibracteati. *Calycis* lobi 5, acuminati, 1·25 mm. longi, 1–1·5 mm. lati, glabri. *Stamina* numerosa, basi disco crenulato cincta, filamentis ad 1·75 mm. longis. *Inflorescentia* ♀ petiolos subaequans ; pedicelli vix 1 mm. longi, glabri, bracteis parvis. *Calyx* 1·5 mm. altus, ovario appressus. *Ovarium* 0·75 mm. altum, basi disco cinctum, placentis duobus, pauciovulatum ; stylus validiusculus, ovario subaequialtus.

Chiengmai, in evergreen jungle on Doi Sootep, 660 m., *Kerr*, 1821.

Decaschistia siamensis, *Craib* [Malvaceae-Hibisceae] ; a *D. crotonifolia*, Wight et Arn., foliis tenuioribus supra scaberulis, floribus fructibus seminibusque minoribus recedit.

Fruticulus ad 1·2 m. altus (ex *Kerr*) ; ramuli primo densius tomentoso-pubescentes praetereaque pilis stellatis rigidioribus longioribus passim instructi. *Folia* late ovata, ovata vel ovato-lanceolata, apice acuta, basi rotundata vel obtusa, interdum subcordata, 6–14 cm. longa, 1–6·5 cm. lata, tenuiter chartacea, supra breviter, tenuiter-stellato-pubescentia praetereaque ob pilos paucos stellatos longiores et multo rigidiores scaberula, subtus densius, molliter tomentosi, margine distanter, irregulariter serrata nisi parte basali integra, e basi trinervata, nervis secondariis (e costa ortis) utrinque 4–6 supra conspicuis subtus prominentibus nervis transversis subtus prominulis costa subtus basin versus glandula ad 4 mm. longa instructa ; petioli 1–3 cm. longi, dense tomentosi ; stipulae e segmentis tribus subaequilongis ad 1·2 cm. longis constituae, caducae. *Flores* axillares, solitarii vel gemini, pedicellis usque ad 7 mm. longis suffulti. *Bracteolae* 10, aequales, lineares, acutae, ad 8 mm. longae et 1·75 mm. latae, extra tomentosae, intra subsericeae. *Calyx* sub anthesin circiter 1 cm. longus, fere ad medium lobatus, lobis late deltoideis acuminatis acutis 5 mm. latis extra hirsutis intra superne appresse pilosulis distincte nervatis ; calyx infructescens parum major. *Corolla* 4 cm. longa, sulphurea nisi basi atropurpurea (ex *Kerr*). *Stamina gynoeciumque* generis. *Capsula* calycem vix aequans, dense hirsuta. *Semina* 3·5 mm. longa, glabra.

Sriracha, in scrub jungle near the sea, *Kerr*, 2105.

Helicteres Gagnepainiana, *Craib* [Sterculiaceae-Helictereae] ; ab *H. Geoffrayi*, Gagnep., ramulis foliisque haud glabris, inflorescentiae rhachi glanduloso facile distinguenda.

Suffrutex sarmentosus, circiter 1 m. altus (ex *Kerr*) ; ramuli cinereo-albidi, pilis minutis stellatis confertis diu persistentibus

obtecti. *Folia* lanceolata, apice indistincte acuminata, mucronata, basi cuneata vel late cuneata, obtusiuscula, 4·5–11·5 cm. longa, 1·3–3 cm. lata, chartacea vel tenuiter chartacea, integra, supra fusca, nisi costa pilis minutis stellatis tecta glabra, subtus pallida, indumento ut ramulis, e basi trinervata, nervis secondariis (e costa ortis) utrinque 6–7 supra subconspicuis subtus prominentibus nervis transversis subtus prominulis; petioli graciles, ad 7 mm. longi, indumento ut ramulis; stipulae 5 mm. longae, 0·75 mm. latae, acutae. *Inflorescentia* brevis, axillaris, rhachi glandulis nigris sessilibus instructo; pedicelli 2·5 mm. longi; bracteae ad 4 mm. longae. *Calyx* extra minute stellato-pubescens; tubus 4 mm. longus; lobi lanceolati, acuti, 2 mm. longi, 1 mm. lati, intra minute stellato-pubescentes. *Petala* purpurea (ex *Kerr*), 8 mm. longi, 1·5 mm. lati. *Androphorium* glabrum, circiter 5 mm. longum.

Sriracha, Nawng Kaw, by side of railway track, 30 m., *Kerr*, 2046.

Named in compliment to Monsieur Gagnepain, to whom I am deeply indebted for comparing this plant and several others of Dr. Kerr's collection with the species described by him in the Flore Generale de l'Indo-Chine.

Pterospermum littorale, *Craib* [Sterculiaceae-Helictereae]; a *P. grewiaefolio*, Pierre, floribus majoribus distinguenda.

Arbor parva (ex *Kerr*); ramuli primo albido- vel pallide rufo-stellato-tomentelli, mox glabri, cortice fusco reticulato-striato obtecti. *Folia* ambitu plerumque oblonga, apice acuminata, acuta, basi inaequalia, truncato-cordata vel latere altero rotundato vel truncato altero late cuneato, 4·5–12 cm. longa, 2–5·4 cm. lata, chartacea, supra glabra, subtus cinereo-tomentella, margine integra vel irregulariter lobata, e basi trinervata vel sub-5-nervata, nervis lateralibus utrinque 6–8 supra leviter impressis subtus prominulis, nervis transversis supra vix conspicuis subtus ob pilos plus minusve delapsos conspicuis; petioli 1 cm. longitudine vix attingentes, indumento ut foliorum pagina inferiore diu persistente. *Flores* axillares, solitarii; pedicelli validi, ad 8 mm. longi et fere 4 mm. crassi, brunneo-tomentelli. *Sepala* 5, linearia, acuta, 7 cm. longa, 7 mm. lata, extra brunneo-tomentella, intra subflavida, pilis rigidiusculis ascendentibus tecti. *Petala* 5, 6·5 cm. longa, apice 1·7 cm. lata, basi in unguem attenuata, parum curvata, extra breviter stellato-pubescentia. *Androphorium* vix 1 cm. longum, glabrum. *Stamina* circiter 15, in fasciculas cum staminodiis alternantes disposita; filamenta circiter 2 cm. longa, ad partem trientem in fasciculas connata; staminodia 5, circiter 5 cm. longa, superne incrassata, pilis paucis minutis stellatis instructa. *Stylus* 5 cm. longus, inferne stellato-pubescens; ovarium 6 mm. altum, albo-hirsutum.

Sriracha, by beach, *Kerr*, 2097.

Euonymus similis, *Craib* [Celastraceae-Celastreae]; ab *E. glabro*, Roxb., floribus majoribus, petalis fimbriatis recedit.

Arbuscula circiter 7·5 m. alta (ex *Kerr*); ramuli glabri, primo subquadrangulares, viridi-straminei, mox teretes, cortice rubro-brunneo obtecti. *Folia* plerumque oblanceolata vel obovato-oblanceolata, apice acuminata, acutiuscula vel obtusa, basi cuneata,

7–12·5 cm. longa, 3–6 cm. lata, coriacea, utrinque glabra, margine revoluto superne serrata, nervis lateralibus utrinque 6–8 supra conspicuis subtus prominulis nervis transversis utrinque plerumque subconspicuis ; petioli ad 1 cm. longi, supra canaliculati. *Cymae* axillares, dichotomae ; pedunculi communes ad 5·5 cm. longi, glabri; pedicelli circiter 7 mm. longi, inferne articulati. *Sepala* exteriora rotundata, circiter 2 mm. diametro, interiora transverse oblonga, 3 mm. longa, 5 mm. lata, omnia ciliata. *Petala* 5, oblongo-cuneata, superne fimbriata, 6 mm. longa, 5 mm. lata, glabra. *Filamenta* circiter 2·5 mm. longa. *Stylus* obtusus, 1·5 mm. altus. *Ovula* 2, superposita. *Fructus* vix 1 cm. altus, pallide viridis vel brunnescens. —*E. sp. n.*, Craib, Kew Bull. 1911, p. 29.

Chiengmai, in evergreen jungle on Doi Sootep, 720–1200 m., *Kerr*, 649, 736, 736*a*.

Euonymus sootepensis, *Craib* [Celastraceae-Celastreae] ; ab affini *E. Griffithii*, Kurz, foliis multo latioribus nervis tenuioribus recedit.

Caules scandentes, quadrangulares vel plus minusve alati, cortice viridi-stramineo obtecti, glabri. *Folia* late obovata, elliptica vel subrotundata, apice breviter acuminata, acuta, basi rotundata vel subcordata, 3–7 cm. longa, 1·7–5·6 cm. lata, chartacea, vel rigide chartacea, sessilia vel subsessilia, utrinque glabra, margine serrulata vel crenulato-serrata, nervis lateralibus utrinque 4–5 pagina utraque subprominulis, supra fusco- subtus pallide viridia. *Cymae* ad 7-florae, axillares, solitariae, et praeterea plerumque duobus decussatis suboppositis circiter 3 mm. supra axillas additis ; pedunculus communis 2 cm. longitudine paullo superans, glaber, basi bractea decidua vix 3 mm. longa brunnea instructus ; pedicelli vix 5 mm. longi. *Calyx* ad medium lobatus, lobis apice rotundatis 1·25 mm. longis vix 2·5 mm. latis pauperrime ciliolatis. *Petala* 4, viridia (ex *Kerr*), subrotundata, 3·5 mm. diametro, subintegra. *Filamenta* circiter 0·5 mm. longa. *Stylus* 0 ; ovula pendula.

Chiengmai, in evergreen jungle on Doi Sootep, 900 m., *Kerr*, 1835.

Indigofera laxiflora, *Craib* [Leguminosae-Galegeae] ; ab *I. subulata*, Vahl, foliolis majoribus numerosioribus, floribus fere duplo majoribus, leguminibus haud reflexis, ab *I. cylindracea*, Wall., foliolis majoribus leguminibus longioribus, ab *I. leptostachya*, DC. foliolorum membranaceorum forma recedit.

Fruticulus flaccidus, vix 1 m. altus (ex *Kerr*) ; caules primo parce appresse brunneo-hirsuti, mox glabri, stramineo-virides nisi inferne rubrescentes. *Folia* imparipinnata, ad 12 cm. longa, petiolo circiter 1·5 cm. longo suffulta, rhachi supra canaliculato ; foliola opposita, utrinque 4–6, plerumque oblongo-obovata, apice rotundata, mucronata, basi cuneata vel late cuneata, ad 4 cm. longa et 2·3 cm. lata, terminale a lateralibus paullo ultra 1 cm. distans, membranacea, utrinque pilis medio-fixis brevibus paucis albis nisi subtus interdum brunneis instructa, petiolulis circiter 1·5 mm. longis suffulta ; stipulae deciduae, circiter 2 mm. longae ; stipellae ad 1 mm. longae. *Racemi* axillares, ad 15 cm. longi, pedunculo communi ad 5 cm. longo suffulti. *Bracteae* sub anthesin deciduae, 1·5 mm. longae. *Pedicelli* ad 5 mm. longi, ut rhachi pilis paucis appressis brunneis instructi. *Calyx* extra parce appresse brunneo-pubescens ; tubus 1·75 mm. longus ; lobi lanceolati, acuti, ad 1 mm. longi. *Corolla* purpurea

(ex *Kerr*); vexillum subellipticum, 8 mm. longum, 6 mm. latum, ungui 1 mm. longo, extra breviter appresse albo-pubescens; alae angustae, vexillo aequilongae; carina alas paullo superans. *Ovarium* circiter 8 mm. longum et 0·3 mm. latum, glabrum, multiovulatum. *Legumen* ad 4·3 cm. longum, 1·5 mm. latum, acuminatum, suturis incrassatum, glabrum.

Chiengmai, in open grassy jungle on Doi Sootep, 1500 m., *Kerr* 1388, 1978.

Tephrosia (Brissonia) Kerrii, *Drummond et Craib* [Leguminosae-Galegeae]; *T. vestitae*, Vog., similis sed floribus leguminibusque multo majoribus, necnon leguminis indumento valde fortiore facile distinguenda.

Suffruticulus caulibus circa bimetralibus erectis rigidis superne fistulosis sub supremam inflorescentiam 2·5 mm. diametro angulatis et leniter sulcatis pilis satis robustis ascendentibus laxe adpressis demum fulvescentibus vestitis. *Folia* imparipinnata, foliolo terminali lateralibus aliquantulo majore; foliola utrinque 5–8, oblongo-lanceolata, breviter sed distincte mucronata, usque ad 7·75 cm. longa, paullo ultra 17 mm. lata, supra olivacea, glabrata, minute sed distincte reticulata, subtus pilis subargenteis satis longis mollioribus adpressis dense vestita, costa necnon margine pilis mox fulvescentibus instructa, nervis primariis circa 3 mm. inter se distantibus leniter arcuatis, secondariis secus primarios parallelis multo obscurioribus; petioluli vix 2 mm. longi, basi pulvinati, inaequaliter hirsuti. *Inflorescentiae* juveniles strobiliformes, circa 20 mm. longae, 10 mm. diametro, denique sub anthesin ad 10 cm. longae; bracteae anguste lanceolatae, argute cuspidatae, 5 mm. longae, 2 mm. (ciliis exclusis) latae, cuspi lineari-subulata circa 5 mm. longa, dorso villosissimae, ad marginem eleganter ciliatae, interne venis paucis satis obviis et pilis candidis adpressis sparse ornatae, caducae; flores rhachidis obscure flexuosi ad nodos singuli insidentes, pedicellis valde villosis post anthesin 6 mm. longis suffulti. *Calyx* extra pilis subasperis 1 mm. longis fulvescentibus laxe adpressis obsitus; tubus late poculiformis, 4 mm. diametro; lobi anguste deltoidei, anterior prope 5 mm., ceteri vix 3 mm. longi, omnes circa 2 mm. basi lati, intra fusci et minute puberuli. *Vexillum* ovato-cordatum, apice breviter emarginatum, basi cuneatum, 2·2 cm. longum, 1·5 cm. latum, in stipitem angustum imo saccatum infra involutum, venis flabellatim dispositis, dorso convexe carinatum, pilis robustis longis fulvis subadpressis vestitum, intra ommino glabratum; alae carinam vix superantes, ei forma similes sed apice obscurissime falcatae, venis satis conspicuis inter se innectis pulchre notatae, margine superiore supra unguem manifeste gibbosae; carina margine anteriore 10 mm. inferiore vix 19 mm. longa, apicem versus obtuse et brevissime rostrata, leniter falcata. *Legumen* 10 cm. longum, 7·5 mm. latum, pilis longis fulvescentibus mollibus prorsus directis vestitum, parte inferiore plus minusve arcuatum, sub apicem margine anteriore in rostrum validum 2·5 mm. longum curvatum abeunte unde exoritur stylus subpersistens, abrupte geniculatus, inferne glaber, superne unilateraliter insigne barbatus.

Chiengmai, in evergreen jungle on Doi Sootep, 960 m., *Kerr*, 1382.

Distr. Yunnan, Szemao, 1500 m., *Henry*, 12715.

Tephrosia (Brissonia) repentina, *Drummond et Craib* [Leguminosae-Galegeae]; e grege *T. tinctoriae*, Pers. (sensu stricto), ab illa necnon a *T. coccinea*, Wall., propter formam et indumentum foliolorum, a *T. Heyneana*, Wall., propter multo majores flores et legumina facile distinguenda; a *T. senticosa*, Pers. (vera), cui omnium maxime affinis, foliolis majoribus oblongo-lanceolatis vel oblongo-obovatis nec oblongo-cuneatis apice obtusis vel acutis nunquam retusis supra obscure nec conspicue striatis, legumine fere duplo longiore valde pubescente aliisque notis bene dignoscitur.

Suffruticulus 30–70 cm. altus, caule circiter 2 mm. diametro obscurius angulato irregulariter sulcato pilis subargenteis mox fulvescentibus subadpressis munito. *Folia* imparipinnata, foliolo terminali lateralibus aliquantulo majore, rhachi adpresse piloso basi inconspicue pulvinato 3·5–7·5 cm. longo; foliola utrinque 3–5, oblongo-lanceolata vel oblongo-obovata, apice obtusa vel acuta, cuiusque jugi superne gradatim majora, infima 4·5 cm. longa, 7 mm. lata, suprema ad 4·5 cm. longa et vix 2 cm. lata, supra cinereo-olivacea, ad venas nebulose fusco-maculata, minute reticulata, glabra nisi nervis lateralibus villos paucos longos candidos sparsissime praebentibus, subtus pilis subargenteis leniter adpressis densius vestita, ad costam prominentem pilis longioribus subpatentibus ad marginem subaureis prorsus directis ornata, nervis omnibus obscuris lateralibus inter se circiter 3·5 mm. distantibus, petiolulis pilis ascendentibus pallide aureis hirsutis suffulta. *Flores* 1–4, terminales vel axillares; bracteae sericeo-canescentes; bracteolae obscuriores, caducae; pedicelli (maturante legumine) vix 4 mm. longi. *Calycis* tubus subpoculiformis, circiter 3 mm. diametro, extra pilis sericeo-canescentibus laxe adpressis vestitus, intra glaber, lobi angustissime deltoidei, anterior circa 4 mm. longus, ceteri circa 2 mm. longi et 1 mm. lati, extra pilis demum subaureis obsiti. *Vexillum* brunneum (ex *Kerr*) circiter 19 mm. longum, medio argute sulcato-lineatum, margine integro, dorso pilis longis aureo-fulvis quasi velutinis dense vestitum; alae albae (ex *Kerr*), carina manifeste breviores, dimidiate oblongo-cuneatae, obscure falcatae, supra unguem gibbosae; carina alba (ex *Kerr*), circiter 18 mm. longa, obtuse rostrata, inferiore margine oblique rotundato, supra mediam longitudinem 6·5 mm. lata. *Stylus* vix geniculatus, alte arcuatus, pilis ascendentibus subaureis aeque munitus. *Legumen* (vix maturum) 9 cm. longum, vix 6 mm. latum, inconspicue falcatum, sub apicem margine anteriore in rostrum vix 3 mm. longum curvatim abeunte, pilis mollibus longis subadpressis satis sordide fulvescentibus dense vestitum.

Sriracha, Nawng Kaw, on clearing in evergreen jungle, 30 m., *Kerr*, 2053.

The specimens received are all of one year's growth, but with regard to the conditions of its occurrence it would hardly be justifiable to regard the species as strictly monocarpic.

Desmodium cephalotoides, *Craib* [Leguminosae - Hedysareae]; *D. Cephaloti*, Wall., facie similis sed floribus magnis facile distinguendum.

Suffruticulus circiter 6 dm. altus (ex *Kerr*); caules trigoni, faciebus sericei, angulis barbati. *Folia* trifoliolata, petiolo 1·5–2·5 cm. longo trigono indumento ut caulibus suffulta; stipulae

deciduae, lineari-lanceolatae, acutae, circiter 1 cm. longae, costatae sicco brunneae, dorso costa pilosae vel fere glabrae, ciliatae ; foliola lanceolata, apice acuta, basi cuneata vel subrotundata, lateralia 3·5–8 cm. longa, 1·5–2·6 cm. lata, terminale a lateralibus 1–2 cm. distans, 5–11 cm. longum, 1·5–4 cm. latum, chartacea, supra costa pilosula excepta glabra, subtus sericea, nervis lateralibus utrinque ad 10 supra conspicuis subtus prominentibus, nervis transversis tenuibus supra subconspicuis ; stipellae ad 8 mm. longae. *Inflorescentia* axillaris, capituliformis ; bracteae vix 3 mm. longae, 1·5 mm. latae, bracteolis similes ; pedicelli 4 mm. longi, sericei ; bracteolae 2, oblongae, acutiusculae, 4 mm. longae, 1·75 mm. latae, costatae, dorso medio apicemque versus barbatae, ciliatae. *Calycis* tubus 2·5 mm. longus, extra parcissime appresse pubescens, intra glaber, lobi 2·5–4·5 mm. longi, ad 2 mm. lati, acuti, extra subsericei, intra pilosuli. *Corolla* alba (ex *Kerr*), glabra, 1·3 cm. longa. *Ovarium* vix 3 mm. altum, suturis pubescens.

Meh Ping Rapids, Ban Kaw, in mixed jungle, *Kerr*, 2022.

Uraria rotundata, *Craib* [Leguminosae-Hedysareae] ; ab *U. lagopoide*, DC., cui valde affinis, foliorum nervis pagina utraque conspicuis, bracteis longioribus angustioribus haud vel vix acuminatis, leguminibus pallidis recedit.

Caules basi lignosi, repentes, graciles, primo breviter pubescentes praetereaque pilis paucis patentibus longis albis instructi, mox puberuli. *Folia* simplicia, ambitu plus minusve rotundata, mucronata, basi leviter cordata, 1·1–3·4 cm. longa, 1·1–2·8 cm. lata, rigide chartacea, supra pilis paucis brevibus scabridula, subtus nervis puberula et pilis paucis longioribus deciduis instructa, ciliata, nervis lateralibus utrinque circiter 7 cum nervis transversis supra prominulis subtus prominentibus ; petioli graciles 1·3–2·7 cm. longi, puberuli ; stipulae angustae, acutae, circiter 7 mm. longae ; stipellae 2 mm. longae. *Racemi* cylindrici, ad 5 cm. longi et circiter 1·5 cm. diametro ; bracteae late lanceolatae, apice attenuatae, acutae, circiter 1 cm. longae et 3 mm. latae, ciliatae, extra puberulae praetereaque pilis paucis longis rigidis instructae, intra glabrae, costatae ; flores gemini, pedicellis 4 mm. longis pilis longis divaricatis paucisque brevioribus instructis suffulti. *Calycis* segmenta ad 6 mm. longa, corollam purpuream superantia, pilis rigidis divaricatis tecta. *Legumen* pallidum, puberulum.

Sriracha, creeping on rocky ground by the sea, *Kerr*, 2136.

Cassia Garrettiana, *Craib* [Leguminosae-Cassieae] ; *C. racemosae*, Mill. sensu stricto affinis, sed foliolis ovato-lanceolatis vel anguste ovatis acuminatis acutis, racemis brevius pedunculatis in axillis plerumque geminis, floribus majoribus recedit.

Frutex vel *arbuscula* (ex *Kerr*), ramulis puberulis cortice rubro-brunneo striato obtectis. *Folia* abrupte pinnata, circiter 15 cm. longa, petiolo communi 3·5–5 cm. longo suffulta, petiolo ima basi puberulo et ut rhachi supra canaliculato ; foliola utrinque 7, ovato-lanceolata vel anguste ovata, apice acuminata, acuta, basi rotundata vel late cuneata, 3·5–8 cm. longa, 2–3·6 cm. lata, rigide chartacea, utrinque glabra, margine cartaligineo, nervis lateralibus utrinque saltem 10 intra marginem arcuatis supra conspicuis vel prominulis subtus subconspicuis vel fere prominulis, nervis transversis uti

reticulatione gracili subtus conspicuis; petioluli 2–4 mm. longi, supra canaliculati, glabri vel fere glabri. *Racemi* axillares, gemini, ad 10 cm. longi, in paniculas terminales dispositi; pedunculus communis plerumque vix 1·5 cm. longus; rhachis valde nodusus, ut pedunculo densius molliter puberulus; pedicelli sub anthesin 2·5–3 cm. longi, puberuli, infructescentes ad 3·5 cm. longi, paullo incrassati; bracteae parvae, deciduae. *Sepala* rotundata vel late elliptica, 0·7–1 cm. longa, 0·5–0·7 cm. lata. *Petala* sulphurea (ex *Kerr*), obovata vel obovato-elliptica, 1 cm. longa, 8 mm. lata, breviter unguiculata. *Stamina* fertilia 7. *Ovarium* subsessile, fere glabrum. *Legumen* compressum, 15 cm. longitudine vix attingens, 3·6 cm. latum, apiculatum, in stipitem 5 mm. longum attenuatum, valvis brunneis tenuiter reticulatis; semina transversa.—*C. racemosa*, Benth., Trans. Linn. Soc. vol. xxvii. p. 549, quoad plantam Schomburgkianam, *vix* Mill.

Sriracha in scrub jungle near sea level, *Kerr*, 2067; Battambong, Anhin, *Schomburgk*, 251.

Siamese name, Mê San (ex *Kerr*).

A specimen collected by Luang Vanpruk (No. 179) at Phre, 120 m., probably also belongs here though the leaflets are much larger.

Parinarium albidum, *Craib* [Rosaceae-Chrysobalaneae]; a *P. sumatrano*, Benth., foliis subtus albo-arachnoideis recedit.

Arbor mediocris (ex *Kerr*); ramuli primo subferrugineo-tomentosi, mox glabri vel fere glabri, cortice rubro-brunneo lenticellato obtecti. *Folia* plerumque oblonga, apice truncata vel retusa, interdum breviter obtuse acuminata, basi parum inaequalia, truncata vel late cuneata, 5–14 cm. longa, 2·5–8·5 cm. lata, subcoriacea, supra costa subferrugineo-tomentella excepta glabra, subtus albo-arachnoidea, nervis lateralibus utrinque 12–15 obliquis supra conspicuis subtus prominentibus, nervis transversis supra conspicuis subtus prominulis; petioli 1 cm. longitudine vix attingentes, supra subferrugineo-tomentelli, canaliculati, subtus sericei, convexi; stipulae caducae. *Flores* in paniculas terminales ad 12 cm. longas 11·5 cm. latas dispositi; pedicelli perbreves; bracteae ovatae, acuminatae, acutae concavae, deciduae, 3 mm. longae, 2 mm. latae, dorso appresse pubescentes. *Calyx* extra subferrugineo-tomentellus, intra villosus; tubus 2 mm. longus; lobi oblongi vel deltoidei, acuti, 1·75 mm. longi, 1–1·5 mm. lati. *Petala* 1·5 mm. longa, vix 1 mm. lata, ciliolata. *Stamina* 7, filamentis ad 1·5 mm. longis glabris. *Ovarium* 1·5 mm. altum, villosum, ovulis solitariis erectis; stylus 2·5 mm. longus, inferne villosus.

Chiengmai, in mixed jungle on lower slopes of Doi Sootep, 300 m., *Kerr*, 604; Kanburi, *Teysmann*.

Terminalia tripteroides, *Craib* [Combretaceae-Combreteae]; a *T. triptera*, Stapf, fructu multo majore facile distinguenda.

Frutex vel *arbuscula* (ex *Kerr*); ramuli juventute fusci, puberuli, mox glabri, cortice rubro-brunneo lenticellato obtecti. *Folia* plerumque elliptica vel late elliptica, apice acuminata, acutiuscula, basi plerumque late cuneata, 5–10 cm. longa, 3·3–5·8 cm. lata, rigide chartacea vel fere subcoriacea, supra nisi costa pilosula glabra, subtus costa nervisque primariis parce pilosula, mox glabra, nervis lateralibus utrinque 6–7 supra conspicuis subtus prominentibus,

nervis transversis subtus prominulis ; petioli circiter 8 mm. longi, supra parum canaliculati, pilosuli. *Spicae* graciles, in paniculas dispositae, rhachi ramulisque subferrugineo-pilosis. *Receptaculum* 1 mm. altum, glabrum. *Calyx* pallide viridis (ex *Kerr*), circiter 1·25 mm. altus, fere ad medium lobatus, lobis deltoideis obtusis pauperrime ciliatis, extra glaber, intra pubescens. *Stamina* exserta. *Stylus* 3 mm. longus. *Fructus* 2·8 cm. altus, 3-alatus, alis circiter 8 mm. latis, glaber.

Meh Ping, Doi Noi, 300 m., in deciduous jungle, *Kerr*, 2010 ; Muang Hawt, 240 m., in deciduous jungle, *Kerr*, 2010a.

2010 is describod as a scrambling shrub and 2010a as a tree.

Terminalia obliqua, *Craib* [Combretaceae-Combreteae] ; *T. tripteroidi*, Craib, facie similis, foliis longius petiolatis et acuminatis distinguenda.

Arbor (ex *Kerr*), ramulis primo breviter appresse pubescentibus mox glabris cortice rubro-brunneo vel cinereo-brunneo reticulato-striato obtectis. *Folia* plerumque ovato-lanceolata, apice acuminata, acuta vel obtusiuscula, basi inaequalia, cuneata, late cuneata vel fere rotundata, 7–11·5 cm. longa, 2·6–5·5 cm. lata, subcoriacea, utrinque glabra, nervis lateralibus utrinque 7–9 satis obliquis supra conspicuis subtus prominulis, nervis transversis uti reticulatione gracili subtus conspicuis ; petioli ad 1·7 cm. longi, supra planiusculi vel parum canaliculati, subtus convexi, fusci. *Spicae* in paniculas dispositae. *Fructus* oblongus, 3 cm. altus, 3-alatus, alis vix 1 cm. latis.

Sriracha, Nawng Kaw, 30 m., *Kerr*, 2073.

Siamese name, Kŭm Chai (Kam Chai)—*Kerr*.

Eugenia siamensis, *Craib* [Myrtaceae-Myrteae] ; ab *E. Jambos*, Linn., foliis formae diversae tenuioribus nervis paucioribus recedit.

Suffrutex vel arbuscula (ex *Kerr*), omnino glaber ; ramuli graciles, cortice pallide brunneo vel rubro-brunneo obtecti. *Folia* anguste oblonga vel oblanceolata, apice acuminata, acutiuscula, basi cuneata, 8·5–13 cm. longa, 2·2–4 cm. lata, chartacea, nervis lateralibus utrinque circiter 8 rectis vel subrectis intra marginem arcuatis supra subconspicuis subtus prominentibus, nervulis subtus conspicuis ; petioli circiter 8 mm. longi et 1·5 mm. crassi, supra canaliculati. *Inflorescentia* e cyma terminali 3-flora constituta ; pedicelli (infra articulationem) 3–5 mm. longi. *Receptaculum* circiter 1·2 cm. altum, parte basali pedicellum simulante 6–7 mm. alta 2–4 mm. diametro parte suprema apice 1·3 cm. diametro. *Sepala* 4, basi breviter connata, subrotundata, 7 mm. longa, circiter 1 cm. lata. *Petala* libera, ad 1·8 cm. longa. *Stamina* perplurima, 3 cm. longa. *Stylus* fere 5·5 cm. longus. *Fructus* plus minusve globosus, paullo ultra 2 cm. altus, calyce styloque diu persistentibus.

Sriracha, Nawng Kai Ploi, in evergreen jungle, 90 m., *Kerr*, 2118.

Siamese name, Bang Kwan (ex *Kerr*).

Begonia (Casparya) Acetosella, *Craib* [Begoniaceae] ; a *B. Roxburghii*, DC., foliis angustioribus basi oblique truncatis vel cordato-truncatis nunquam alte cordatis recedit.

Herba circiter bimetralis (ex *Kerr*) ; caules glabri vel juventute subglabri, primo flexuosi, striati, basi ad 8 mm. diametro. *Folia* alterna, lanceolata vel oblongo-lanceolata, apice acuminata, acuta,

basi oblique truncata vel cordato-truncata, 13–27 cm. longa, 3–8·5 cm. lata, membranacea, supra parcissime setulosa, subtus costa nervisque setulosa, margine setoso-serrulata, e basi circiter 5-nervata, nervis secondariis (e costa ortis) atrinque ad 7 pagina utraque sicco prominulis, nervis transversis satis distantibus utrinque conspicuis ; petioli 1–12 cm. longi, glabrescentes ; stipulae brunneae, lanceolatae, acutae, 1–1·3 cm. longae, 3·5 mm. latae, deciduae. *Flos* ♂ pedicello ad 1·4 cm. longo ut pedicello ♀ bibracteato suffultus. *Sepala* 2, obovato-elliptica, 1·4 cm. longa, 1·2 cm. lata. *Petala* 2, oblongo-oblanceolata, circiter 1·3 cm. longa et 0·5 cm. lata. *Stamina* perplurima, filamentis liberis, connectivo manifeste producto. *Flores* ♀ axillares, solitarii, pedicellis 0·5–1 cm. longis bracteolis majusculis stipulis conformibus paullo supra basin instructis suffulti. *Sepala* petalaque maris sed minora.—*B.* sp. n., Craib, Kew Bull. 1911, p. 58.

Chiengmai, in damp shady spots by stream on Doi Sootep, 660–900 m., *Kerr*, 557, 1744.

Sphenodesme (Eusphenodesme) mollis, *Craib* [Verbenaceae-Symphoremeae]; ob folia subtus parce molliter pubescentia distincta.

Suffrutex scandens ; ramuli primo tomentelli, mox parce pilosuli ; rami glabri, cortice brunneo-cinereo parce lenticellato obtecti. *Folia* oblongo-elliptica, apice acuminata, acuta, basi late cuneata, 4–12 cm. longa, 2–8·5 cm. lata, chartacea, supra pilosula, subtus parce molliter pubescentia sed costa brevius appresse pubescentia, nervis lateralibus utrinque 5 6 supra leviter impressis subtus prominentibus, nervis transversis supra subimpressis subtus prominulis ; petioli circiter 1 cm. longi, tomentelli. *Cymae* capitatae, 7-florae, in paniculas terminales dispositae ; bracteae cuiusque capituli 6, oblanceolatae vel oblanceolato-spatulatae, apiculatae, circiter 2 cm. longae et 6 mm. latae, utrinque pilosulae, plus minusve distincte nervatae. *Calyx* extra subsericeus, intra superne pilosulus ; tubus 3·5 mm. longus ; lobi deltoidei vel late deltoidei, 1·25 mm. longi, apice breviter bifidi. *Corollae* tubus 4·75 mm. longus, lobi oblongi, apice rotundati, circiter 3 mm. longi et 2·25 mm. lati, intra basi dense villosi. *Stamina* paullo exserta. *Ovarium* pilis albidis erectis rigidiusculis obtectum, circiter 1 mm. altum ; stylus circiter 6·5 mm. longus, apice bifidus, glaber.

Sriracha, Nawng Kaw, in evergreen jungle, 30 m., *Kerr*, 2075.

Hymenopyramis siamensis, *Craib* [Verbenaceae-Caryopterideae]; ab *H. brachiata*, Wall., indumento diverso, calyce fructescente multo majore recedit.

Suffrutex petiolis arcuato-deflexis scandens ; ramuli subferrugineo-tomentelli ; rami latere altero brunnei, puberuli, altero subferrugineo-tomentelli, striati, lenticellis (?) in lineas 8 regulariter dispositis instructi. *Folia* plus minusve elliptica, apice acuminata, acuta, basi late cuneata, ad 14 cm. longa et 7·5 cm. lata, supra parce brunneo-pilosula, subtus molliter pubescentia, glandulosa praetereaque huc illuc pilis rigidis erectis nigris instructa, chartacea, nervis lateralibus utrinque 6–8 supra leviter impressis subtus prominentibus, nervis transversis supra leviter impressis subtus prominulis ; petioli ad

2·4 cm. longi, subferrugineo-tomentelli praetereaque pilis paucis atris instructi. *Inflorescentia* generis. *Calyx* infructescens pedicello ad fere 2 cm. longo suffultus, ad 5·2 cm. longus, basi poculiformis, utrinque pubescens. *Fructus* dense ablo-hirsutus.

Sriracha, Nawng Kaw, in evergreen jungle, 30 m., *Kerr*, 2087. Siamese name, Wang Sum (ex *Kerr*).

XVI.—MISCELLANEOUS NOTES.

Mr. John Lambourne, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Superintendent of Government Plantations in the Federated Malay States.

G. Maw.—Mr. George Maw, who was born in 1832, was a man of very wide interests and for more than half a century a prolific contributor to various scientific journals. He was the head of a firm of manufacturers of artistic tiles and other kinds of pottery at Broseley in Shropshire. At first he turned his attention to British Botany, and in 1853 contributed to the "Phytologist," a paper on the plants of the Valleys of the Taw, the Tamar and the Torridge. He found *Lilium pyrenaicum* in a naturalised condition near Molton in S. Devon. In 1860 he became a Fellow of the Linnean Society, and also joined the Geological Society and the Society of Antiquaries. Maw formed a large collection of living hardy plants in his garden at Benthall Hall, Broseley, and travelled extensively amongst the mountains of Europe, Asia Minor and North Africa collecting. Among his discoveries were *Draba Mawii* on the Spanish Sierra Nevada and *Saxifraga Maweana* on the mountains above Tetuan. In 1871 Sir Joseph Hooker, Mr. John Ball and Mr. George Maw went on an expedition together to investigate the flora of the Greater Atlas, the outcome of which was the well-known book of travels published by Macmillan in 1878, to which Maw contributed an account of the geology of the country, and also Mr. Ball's "*Specilegium Florae Maroccanae*," contained in Volume xvi of the Journal of the Linnean Society, in which a large number of new species are described and many of them figured. About 1875 Mr. Maw began to concentrate his attention on the genus Crocus and travelled extensively in Greece and Asia Minor, the head-quarters of these delightful plants, to study and collect the species in their native localities. After many preliminary studies, published in the "Gardeners' Chronicle" from 1877–81, and in the Journal of the Linnean Society, he published his great monograph on the genus Crocus in 1886 with quarto plates of all the 67 species drawn and coloured by himself. He presented to the Royal Botanic Gardens an almost complete set of the living plants of the different species, and so keen was his interest that he came to Kew and planted them with his own hands to ensure the species being correctly separated. Sir Joseph Hooker dedicated to him a

volume of the Botanical Magazine (30th vol. of the 3rd series), and Mr. Wm. Robinson a volume of "The Garden" with a notice and a portrait. In May, 1886, Mr. Maw left his old residence at Broseley for Kenley in Surrey, where he has lived in retirement and where he died on February 7th, 1912, at the age of 79.

J. G. B.

Pond-weed and Copper Sulphate.—A frequent application for advice made to Kew is from correspondents whose ponds or lakes are infested during summer by the various forms of *Algae* or "weed" found in British waters. Everyone knows the unpleasant nature of the scum-like and other growths that are nearly always seen at that season on still, or nearly still, water. They not only frequently destroy the beauty of ponds entirely for a time, but are offensive to the nostrils as well. A good deal of this annoyance may be avoided by the use of copper sulphate. Owing to the water of the Lake at Kew being pumped for garden purposes (including the watering of ferns and other low types of vegetation) it is considered inadvisable to use copper sulphate there, but it is employed with advantage in the smaller ponds. The proportion used is 1 part copper sulphate to anywhere from 750,000 to 1,000,000 parts of water. It is first necessary to ascertain, approximately at least, the cubic contents of the water to be treated. The sulphate of copper should be obtained in a pulverised state, placed in a porous bag, and dragged through the water until dissolved. It does not matter how the sulphate is distributed so long as it is done thoroughly. It may be dissolved previously and sprayed evenly over the surface, provided no water-lilies or other aquatic phanerogams are in growth. It may be mentioned that a cubic foot of water weighs about $62\frac{1}{4}$ lbs.

During the last two summers a striking example of the effective use of copper sulphate has been provided in St. James's Park. Previously, it had been a costly and troublesome matter to keep the water there presentable in hot weather by employing men in boats to remove the weed with rakes, &c. The copper sulphate treatment was adopted, with the result, we learn, that at a much less expenditure in money and labour it can now be kept practically free from weed.

A fact of considerable interest has also been reported by the Superintendent. The ponds are cleaned out triennially and the surplus fish disposed of. In recent years it has been found that many of the fish were badly attacked by fungus, so much so that it became doubtful whether it was advisable to transfer them to other waters. We learn that at the last cleaning out the fish were quite free from fungoid disease and remarkably clean and silvery. This is of especial interest because one of the doubtful matters about the use of copper sulphate in water was its effect on fish. It has been found in America that certain delicate species were affected, but usually when a considerably stronger application was used than that mentioned above.

W. J. B.

Horse Poisoning by Equisetum arvense.—Several cases of horse poisoning in which *Equisetum arvense*, L. (the common horsetail), was the suspected plant having been submitted to Kew during the last year, it has been thought advisable to take note of some experiments carried out at Valley, Nebraska, the results of which were published in the "Nineteenth Annual Report of the Agricultural Experiment Station, Nebraska" (1906), pp. 111–115.

Two animals were experimented upon, one an aged mare and the other a six year old gelding. The experiments were apparently continued longer with the horse than with the mare. No grain was given and the amount of dried *Equisetum* mixed with the hay was gradually increased from half a pound to six pounds per day. At first the animals seemed to prefer the *Equisetum* to the rest of the hay, but on the fourth day the mare and on the twelfth the horse showed an aversion to it which increased as the experiment continued till near the end the greatest difficulty was experienced in getting the animals to touch it. The first symptoms of poisoning appeared early. On about the fourteenth day the animals began to show a hesitating, staggering gait, which alternately appeared and disappeared throughout the course of the experiment. Other symptoms noted were loss of muscular control, poor condition of the flesh, and an unusual sensitiveness of the shoulder, these being accompanied by normal or subnormal temperature and a good appetite. The diuretic properties of the plant were shown by the constant saturation of the ground with urine which was persistently alkaline. It was found that in general the attacks of staggering coincided with the wet cold days, at least during the first half of the experiment. Towards the last the horse, losing control of its legs, fell many times. It also appeared more stupid and yawned frequently. The experiment was abandoned here owing to the refusal of the horse to take *Equisetum* either as hay or as a decoction. The vicious nature of the animal prevented the use of the decoction as a drench.

The conclusions arrived at are two, namely, that the weed must be present in large quantities to be dangerous to horses, but that when taken in sufficient amount it is fatal to these animals.

W. B. T.

Symplocos luzoniensis.—Some confusion has arisen between two Philippine species of *Symplocos* which it is desirable to clear up. The name *Symplocos montana*, Vidal, proving untenable, because of the earlier *S. montana*, Brongn. & Gris., a New Caledonian species, the Philippine plant was re-named *S. luzoniensis*, Rolfe. To the latter Brand has now referred a specimen collected in the Caraballo Mountains, in the Province of Nueva Ecija, Vidal, 2141, which unfortunately does not agree with the original—a plant apparently not seen by Brand. From this specimen the technical description and the characters in the key in Brand's Monograph were evidently drawn. Apparently relying upon these characters Merrill has described a new species under the name of *S. depauperata*, which I cannot distinguish from *S. luzoniensis*, Rolfe. The following is the

synonymy of the two species, and as the second is without a specific name that of *S. Vidalii* is proposed :—

S. luzoniensis, *Rolfe* in Brit. Journ. of Bot. 1886, p. 348. *S. montana*, Vidal Revis. Pl. Vasc. Filip, p. 179 (nec Brongn. et Gris.). *S. depauperata*, Merrill in Philipp. Gov. Lab. Bur. Bull. xxix. p. 45.

Island of Luzon. Prov. Tayabas, Dolores, *Vidal*, 64 bis, 982 ; Mount Banahao, 1830 m., *Vidal*, 67 ; Prov. Benguet, Tonglon, *Loher*, 410 ; Atoc, *Loher*, 412 ; Benguet, *Loher*, 414 ; Data, *Loher*, 441, *Merrill*, 4526 ; Baguio, *Elmer*, 5909, 6508, *Merrill*, 4333, *Williams*, 961.

S. Vidalii, *Rolfe*. *S. luzoniensis*, Brand in Engl. Pflanzenr. Symplocac. p. 61 (nec Rolfe).

Island of Luzon. Prov. Nueva Vizcaya, Mt. Caraballo sur, *Vidal*, 2141.

The former species is readily distinguished by its smaller, more ovate, serrate leaves, and nearly glabrous calyx tube.

As *S. Brandiana*, Schlechter, in Engl. Jahrb. xxxix. p. 227, is untenable, on account of the earlier *S. Brandiana*, King & Gamble, this New Caledonian species may be called *S. oubatchensis*, Rolfe, from the mountain on which it was collected.

R. A. R.

Botanical Magazine for March.—The plants figured are *Brunfelsia undulata*, Swartz (t. 8422) ; *Syringa Julianae*, C. K. Schneider (t. 8423) ; *Dombeya calantha*, K. Schum. (t. 8424) ; *Corokia Cotoneaster*, Raoul (t. 8425) ; *Cereus Silvestrii*, Speg. (t. 8426).

Brunfelsia undulata is a West Indian species and was first introduced into this country from Jamaica about a century ago. It has white or sometimes yellowish flowers, with a very long corolla-tube, and like *B. americana*, Swartz, which differs in having obtuse instead of tapering leaves, it has a cup-shaped calyx with very short obtuse lobes. The plant which furnished the material for the figure was obtained from Messrs. J. Veitch & Sons in 1904.

Syringa Julianae was recently described for the first time from a plant supplied by Messrs. Veitch from their Coombe Wood nursery, where it had been raised from seed collected in Western China by Mr. E. H. Wilson, and grown under the name of *S. villosa*. It is most closely allied to *S. pubescens*, Turcz., and with that species forms a small group distinguished as the *Pubescentes*, which is included in the section to which the well-known *S. vulgaris*, Linn., belongs. In *S. Julianae* the younger branches, leaves and inflorescence are more or less pubescent, and the flowers are white and lilac-purple.

The *Dombeya*, as grown in the Mexican House at Kew, is a shrub 11–12 ft. high, with large 3-lobed or sometimes 5-lobed leaves. Its flowers are borne in large corymb-like cymes, and superficially resemble those of the Musk Mallow. It is a native of British Central Africa whence the first material was sent to Kew by the late Mr. Alexander Whyte, having been collected by him and Mr. J. M. McClounie. The plant from which the specimen

figured was obtained was raised at Kew from seeds received from Mr. J. Medley Wood, Director of the Botanic Gardens at Durban.

Corokia Cotoneaster is a familiar New Zealand shrub, and is recorded as being in cultivation at Kew in 1876. It thrives out-of-doors on a south wall, but is killed or injured by severe frost in the open ground. In Canon Ellacombe's garden at Bitton, near Bristol, there is a fine specimen growing in a sheltered corner, and from this the figure has been prepared.

Cereus Silvestrii comes from the Argentine Republic. It is an elegant species, having slender prostrate or ascending stems, and bright orange-scarlet flowers which are freely produced. The specimen figured was obtained from a plant purchased early last year from Messrs. Haage & Schmidt of Erfurt.

Abor Expedition.—In a letter to the Director written from Kobo on 8th December, 1911, during the course of the Abor Expedition under Major-General Bower, Mr. I. H. Burkill speaks of the climate experienced as cold at nights with the Mishmi Hills which are in sight already carrying a lot of snow. Looking eastwards from Kobo, Daphabum seems to end the mountains, but away behind, towards China, are more snows. Looking south-east no hills can be seen, so complete does the break appear between Daphabum and the Naga Hills. Snow can hardly be seen to the north in the Abor Hills; they rise like a wall hiding what lies behind the Dihong. Janakmukh is two marches away round the angle of the nearer line of hills and is stated to enjoy only five hours of sunshine in a day.

Botanically Mr. Burkill has found Kobo very interesting. The forest includes four layers:—

(1) Occupied by trees not very large leaved and wind-distributed, such as *Terminalia myriocarpa*, *Cedrela Toona*, *Cerbera*, or if large leaved deciduous, such as *Sterculia*;

(2) Occupied by smaller trees with large leaves and bird-distributed from fruits which often fall to the ground, as for example *Dillenia indica* and a Magnoliad;

(3) The air-space;

(4) Occupied by the ground vegetation of *Piperaceae*, *Rubiaceae*, &c., small leaved and bird-distributed.

Over all is a tangle of lianes, those which reach highest wind-distributed like the trees; the less lofty bird-distributed.

Measuring the light in the depth of this forest Mr. Burkill finds it to be $\frac{1}{200}$ to $\frac{1}{400}$ of what it is on the river bank.

Funtumia Rubber.*—It is not often that a plant within little more than a decade from its discovery is made the subject of an exhaustive monograph running over 252 pages, and covering nearly all aspects under which it presents itself to the botanist and the practical man. But such is the case with *Funtumia elastica* which, in Mr. Cuthbert Christy, has found an excellent interpreter.

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* The African Rubber Industry and Funtumia elastica ("Kickxia"). By Cuthbert Christy, M.B., C.M.

Although the existence of a new and important rubber tree in West Africa became known about 1883, it was not until 15 years later that its botanical status was made out, and then a few more years elapsed before it was sufficiently described to allow of its safe discrimination from very similar but valueless allies. Meanwhile, the commercial value of *Funtumia* rubber had become established, planting experiments had been taken up, and new areas of spontaneous occurrence of the tree added to the one originally known, demonstrating the existence of the species over a forest belt extending from Sierra Leone in the west to Uganda* in the east. At the same time a considerable diminution of the rubber supply from other African sources, and even of *Fuutumia* rubber, made itself felt owing to reckless and wasteful working, and it became evident that the falling-off could in the end only be balanced by systematic planting. American rubber plants were, of course, thought of, but among the numerous indigenous sources *Funtumia elastica* seemed to be the only promising species. It was at this critical period that the author became acquainted with the plant, and the rather primitive methods by which the rubber was obtained. Recognising the great importance of the tree and the economic possibilities of a rational treatment, he set to work to study its structure and life-history, the conditions of its distribution and the chemical and physical nature of its latex. With the knowledge thus acquired, he also sought to improve the methods of tapping and of the coagulation of the rubber, and to lay down the principles for the conservation of the tree in its natural state and for its treatment in plantations. Finally he embodied his experiences in the book under review, a book which is a fine instance of how an eminently practical problem and at the same time one of applied botany can and ought to be dealt with. The author wrote out the book at home, but he did the work in the field during a five years' stay in East Africa and Uganda, and in repeated travels in most of the West African colonies. This, in connection with a truly scientific—that is, rational—working plan, will make the book of lasting value to an industry which will for long be one of the greatest assets of the tropical colonies. It may only be added that the book is very well written and amply illustrated by over 100 photographs, 10 full-plate drawings, a map, and a number of instructive diagrams.

O. S.

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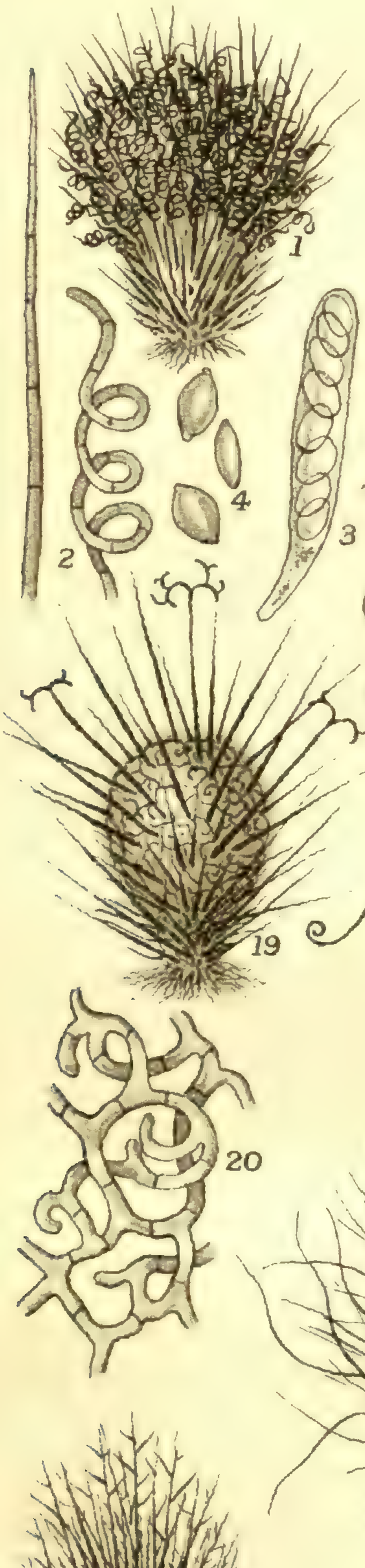
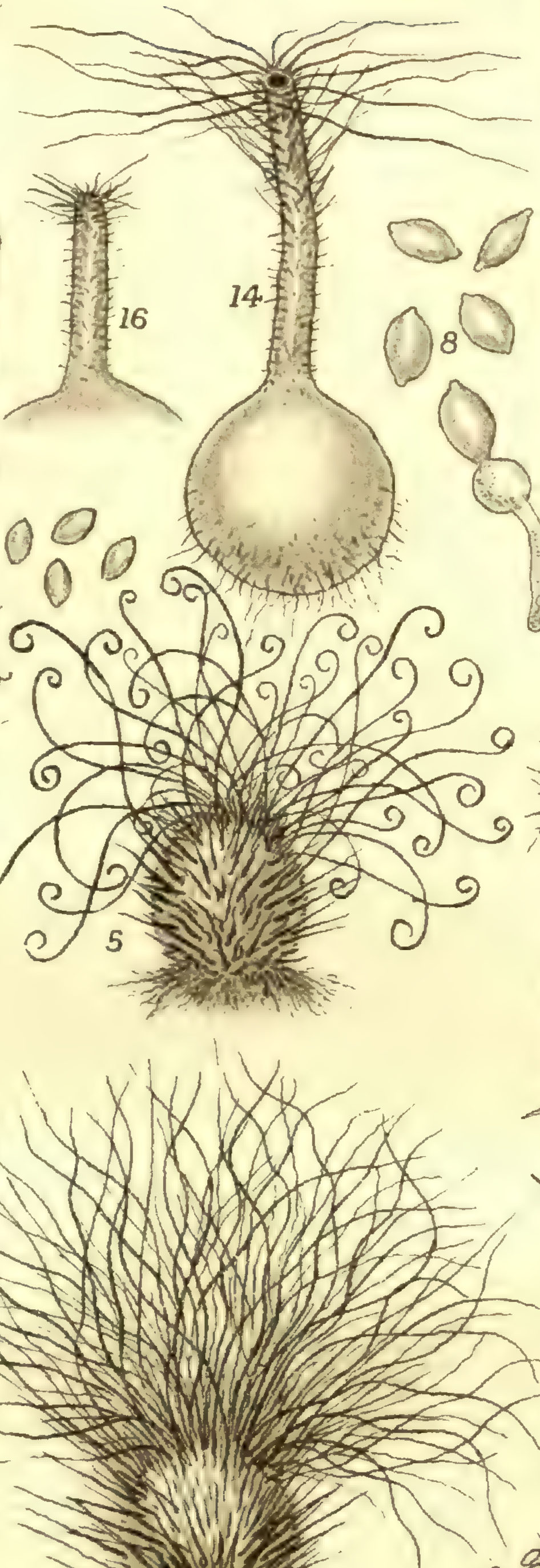
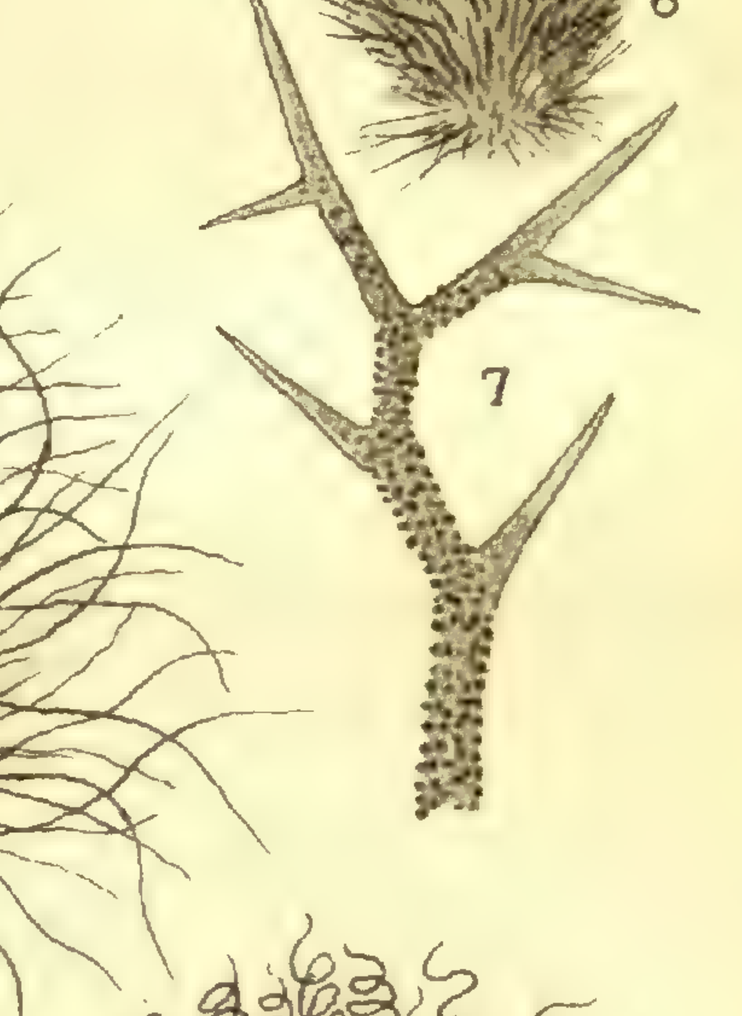
* Whilst this note was being written, news was received from Mr. E. Battiscombe, Conservator of Forests, of the discovery of *Funtumia elastica* in that portion of the Victoria Nyanza Basin which forms part of the British East Africa Protectorate. The tree is stated to occur there in considerable numbers at 5000–6000 feet.







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Chaetomium and Ceratostoma.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 4.] [1912.

XVII.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW.—XIII.

G. Massee.

Chaetomium.

The species enumerated have all, without exception, been studied from specimens that have appeared spontaneously on old cultures, in Petri dishes, &c., in the Jodrell Laboratory.

The members of the genus *Chaetomium*, owing to their fragility, do not make good herbarium specimens, and as the species are in a somewhat chaotic condition, advantage has been taken of the occurrence of living material to furnish amended diagnoses of the British species.

Chaetomium, *Kunze*, Myc. Heft, 1, p. 15 (1817); Zopf, Entwickel. d. Ascomyceten, p. 274 (1881); Sacc., Syll., 1, p. 220 (1882); Cooke, Hdbk. Brit. Fungi, 2, p. 652 (1871).

Perithecium superficial, varying form from subglobose to cylindrical, rigid, very fragile and breaking up when the spores are mature, dark brown or blackish, mouth small, papillate, pale, surrounded by a dense cluster of straight or variously curved, simple or branched, rigid setae, collectively constituting the crown-hairs. *Asci* clavate or sub-cylindrical, 8-spored, deliquescing at an early stage. *Paraphyses* absent. *Spores* 2-seriate or rarely 1-seriate, 1-celled, laterally compressed, varying from circular to broadly lemon-shaped in a front view, often apiculate, becoming dark coloured, usually blackish-olive.

The presence of hairs on the perithecium, in so many genera included in the *Sphaeriaceae*, reaches the maximum of development in *Chaetomium*, where the crown-hairs usually form a dense tuft much exceeding in size that of the perithecium. These hairs present great variety of structure and forms in different species, sometimes quite simple and straight, in others again slightly wavy or flexuous, or coiled into a long, cylindrical spiral, all the turns being in the same direction, or one half of the spiral turning from

(23773—6a.) Wt. 189—808, 1125. 5/12. D & S.

right to left, the other half turning from left to right, with a short straight piece between the two opposite spirals, as in some tendrils. The crown-hairs are usually asperate, or roughened by minute particles of oxalate of lime.

The wall of the ascus deliquesces at an early stage, leaving the spores free in the perithecium, from which they are expelled at maturity by the swelling, under the influence of moisture, of the mucilage resulting from the deliquescence of the asci and cells composing the inner layers of the wall of the perithecium. When extruded from the ascus, the spores form a solid mass, surrounded by the crown-hairs, and are eventually dispersed by rain, &c.

The spores are lentil-shaped, or bi-convex, and often apiculate at one or both ends. Colourless at first, the epispore passes through various shades of green and olive, and eventually becomes brownish-olive, and usually quite opaque. The epispore is quite smooth in all known species.

Zopf has given an exhaustive account of the morphology of the various species of *Chaetomium* accompanied by very beautiful illustrations in Entwickelungsgeschichte der Ascomyceten ; *Chaetomium*. Nova Acta der Ksl. Leop.-Carol, Deutschen Akademie der Naturforscher, Band xlii., no. 5.

Key to the Species.

Crown-hairs spirally coiled throughout their length—
- All the crown-hairs spirally coiled ... ... *C. bostrychodes.*
- Straight hairs mixed with others that are spirally coiled *C. crispatum.*

Crown-hairs straight or slightly wavy, circinate at the tip—
- Spores 14–18μ diam. ... ... *C. murorum.*
- Spores 7–9μ diam. ... ... *C. arachnoides.*

Crown-hairs with an interrupted spiral, turning alternately to left and right ... ... *C. simile.*

Crown-hairs slightly wavy throughout their length *C. Kunzeanum.*

Crown-hairs straight, branched—
- Perithecium elongated, sub-cylindrical ... *C. comatum.*
- Perithecium broadly elliptical or sub-globose *C. pannosum.*

Chaetomium bostrychodes, *Zopf*, Entwickel. d. Ascomyceten, p. 81, tab. 7, figs. 14–28 (1881) ; Sacc., Syll., 1, p. 224 (1882).

Perithecium narrowly elliptical, or sometimes almost cylindrical, 320–350μ high, 200–240μ broad, brown ; mouth small, papillate, almost colourless ; crown-hairs rather stout, septate, slightly asperate, closely coiled into a long, cylindrical spiral up to the end, collectively forming a large, subglobose tuft ; hairs on the body of the perithecium short, straight, sharp-pointed, blackish, at first spreading, then pointing upwards ; rhizoids not very numerous. *Asci* clavate, 50–55 × 11–14μ. *Spores* irregularly 2-seriate, broadly elliptical, laterally compressed, smooth, olive-brown, 6–7·5 × 5μ. *Conidia* unknown.

Hab.—On decaying plant and animal remains, dung, &c. On blotting-paper in a Petri dish, Jodrell Laboratory, Kew.

Most closely allied to *C. spirale*, Zopf, which differs in its larger size, and lemon-shaped, larger spores.

Chaetomium crispatum, *Fuckel*, Symb. Mycol., p. 90 (1871). Sacc., Syll., 1, p. 224 (1882); Zopf, Entwickel. d. Ascomyceten, p. 81, tab. 7, figs. 1–13 (1881).

Perithecium broadly elliptical, blackish-brown, 400–500μ long, up to 350μ broad, mouth small, papillate; crown-hairs of two kinds mixed together, some straight or very slightly waved, pointed, dark coloured, and often more or less asperate, others coiled into a spiral almost throughout their entire length, dark, stout, pointed, the whole forming a dark, olive-tinged head; hairs on the body of the perithecium, short, pointed, straight, dark-coloured. *Asci* cylindrical, averaging 100 × 10μ. *Spores* 1-seriate, broadly elliptical and minutely apiculate at each end, or sometimes almost globose, compressed, olive-brown, 12–14 × 10μ. *Conidia* unknown.

Hab.—On decaying potato tubers, on dung, &c. On old damp blotting-paper in a Petri dish, Jodrell Laboratory, Kew.

Readily recognised by the cylindrical ascus, 1-seriate spores, and the crown-hairs being of two forms. Most closely allied to *C. spirale*, Zopf, which differs in the broadly clavate ascus, and 2-seriate spores.

Chaetomium murorum, *Corda*, Icon. Fung., 1, p. 24, fig. 293B (1837); Sacc., Syll. 1, p. 223 (1882); Zopf, Entwickel. d. Ascomyceten, p. 80, tab. 6, figs. 13–20 (1881); Cooke, Hdbk. Brit. Fungi, 2, p. 653 (1871).

Perithecium varying from broadly elliptical to subglobose, averaging 150–250μ high, by 150–200μ broad, blackish-brown, mouth minute, paler; crown-hairs cylindrical, dark coloured, thin, slightly wavy throughout their length, and with a small curl at the tip, often asperate, the whole forming a large, rather loose tuft; hairs on the body of the perithecium short, pointed, dark coloured, often asperate. *Asci* broadly clavate, shortly stalked, 80–100 × 11–14μ. *Spores* 2-seriate, elliptical, minutely apiculate at each end, dark brown, laterally compressed, 14–18 × 8–9μ. *Conidia* unknown.

Hab.—On old damp plaster, on dung, &c. On old rice paste in a Petri dish, Jodrell Laboratory, Kew.

Distinguished by the long, flexuous crown-hairs, with a small, close curl at the tip.

Chaetomium arachnoides, *Mass. & Salm.*, in Ann. Bot., 16, p. 71, pl. 4, figs. 97–103 (1902); Sacc., Syll., 17, p. 600 (1905).

Perithecium small, subglobose, blackish, 200μ high by about 180μ broad; mouth small, papillate, pale; crown-hairs very long, slender, wavy, often circinate at the tip, 4–5μ thick, smooth, dark coloured, collectively forming a large, widely spreading tuft; hairs on the body of the perithecium short, straight, pointed, dark coloured. *Ascus* clavate, averaging 36 × 12μ. *Spores* irregularly 2-seriate, broadly elliptical or subglobose, laterally compressed, yellowish brown, 7–9 × 5–6μ. *Conidia* unknown.

Hab.—On sheep's dung, and on damp blotting-paper.

Readily distinguished by the very long, flexuous crown hairs, which are often fasciculate at the base, and more or less circinate at the tip.

Chaetomium simile, *Mass. & Salm.*, in Ann. Bot., 16, p. 71, pl. 4, figs. 8–9 (1902); Sacc., Syll., 17, p. 600 (1905).

Perithecium subglobose, 50–75μ broad, blackish-brown; mouth small, papillate, pale; crown-hairs brown, smooth, loosely and interruptedly spirally twisted, some coils from left to right, others in the opposite direction, tips often uncinate, the whole forming a dense tuft of a dusky olive colour; hairs on the body of the perithecium short, straight, pointed, brownish. *Asci* cylindrical, 80–90 × 10μ. *Spores* obliquely 1-seriate, broadly elliptical or subglobose, compressed, one end minutely apiculate, the other end rounded, olive-brown, 8–10 × 7·5μ. *Conidia* unknown.

Hab.—On dogs' dung.

Most nearly allied to *C. crispatum*, Fuckel, which differs in having larger spores, apiculate at both ends, and in the crown-hairs being more closely spirally coiled throughout their length, and mixed with other hairs only slightly flexuous.

Chaetomium Kunzeanum, *Zopf*, Entwickel. d. Ascomyceten, p. 82, tabs. 1–3, tab. 4, figs, 1–13 (1881).

Perithecium broadly elliptical, dark brown, 300–350μ high, about 250μ broad; mouth papillate, pale; crown-hairs very long, wavy, sometimes with a curl at the tip, stout, dark brown sometimes olive or yellowish, asperate, collectively forming a large, dense tuft; hairs on the body of the perithecium stout, straight, pointed, dark coloured. *Asci* clavate, with a stem of variable length, averaging 100 × 11μ. *Spores* irregularly 2-seriate, broadly elliptical, laterally compressed, minutely apiculate at both ends, 11–14 × 8–10μ, olive-brown. *Conidia* are produced on the hyphae of germinating spores, similar to those described under *C. pannosum*.

Syn. *Chaetomium chartarum*, Ehrb., Sylv. Myc. Berol., p. 27 (1818); Sacc., Syll., 1, p. 223 (1882). *C. Fieberi*, Corda, Icon. Fung., 1, p. 24, f. 293, c (1837); Sacc., Syll., 1, p. 223 (1882). *C. Fieberi*, var. *chlorina*, Sacc., Mich., 1, p. 27 (1877); Sacc., Syll., 1, p. 233 (1882). *C. chlorinum*, Grove, Journ. Bot., 50, p. 47 (1912).

Hab. On damp paper, old cord, decaying vegetable matter, &c. On old damp blotting-paper in a Petri dish, Jodrell Laboratory, Kew.

A very variable species, the extreme forms of which, seen independently, have been mistaken for distinct species, but which, when an extensive collection is available, are found to be connected with each other by intermediate forms.

The colour of the hairs ranges from blackish-brown, through olive to yellow.

Chaetomium comatum, *Fries*, Syst. Myc. 3, p. 253 (1829); Sacc., Syll. 1, p. 221 (1882); Cooke, Hdbk. Brit. Fung., 2, p. 652 (1871).

Perithecium elongated, cylindric-ovate or sometimes inclined to cylindric-clavate, brown, length variable, 400–500 × 150–250μ broad, blackish-brown; mouth small, paler; crown-hairs elongated, straight, stout, blackish, often asperate, with short, pointed, spreading branches, the whole forming a dense, erect tuft; hairs on the body of the perithecium straight, unbranched, pointed, blackish,

ascending; rhizoids present. *Asci* clavate, shortly stalked 40–55 × 14–16μ. *Spores* irregularly 2-seriate, broadly elliptical, laterally compressed, smooth, brown with an olive tinge, 10–13 × 9–10μ.

According to Fuckel, *Sporodum conopleoides*, Corda, is the conidial form of this species. This suggestion however turns on the frequent contiguity of the two forms, and remains to be corroborated or otherwise, by pure cultures.

Syn. *Chaetomium elatum*, Kunze, Deutschl. Schwämme, No. 184 (1837); Zopf, Entwickel. d. Ascomyceten, p. 83 (1881). *C. Fieberi*, Fuckel, Symb. Myc. p. 90 (1869–70). *C. lageniforme*, Corda, Icon. Fung., p. 24, tab. 7, fig. 293a (1837). *C. atrum*, Tul., Sel. Fung. Carp., 2, p. 268 (1863). *C. funicolum*, Cooke, Grev. 1, p. 176 (1873); Sacc. Syll., 1, p. 226 (1882).

Hab. Frequent on damp straw and decaying vegetable matter of all kinds, also on dry dung. On damp blotting-paper in a Petri dish in the Jodrell Laboratory, Kew.

Distinguished by the elongated, narrowly elliptical perithecium, and the branched crown-hairs.

Chaetomium pannosum, *Walbr.*, Flor. Crypt. Germ., 2, p. 267 (1831); Sacc., Syll. 1, p. 221 (1882); Zopf, Entwickel. d. Ascomyceten, p. 80, tab. 4, figs. 14–26. tab. 5, figs. 1–11 (1881).

Perithecium relatively large, broadly elliptical, blackish-brown, 400–500μ high, 300μ broad; mouth papillate, pale; crown-hairs stout, dark brown, asperate, angularly bent and giving off stout, straight, pointed branches from the outer angles, the whole forming a large dense tuft; hairs on the body of the perithecium dark coloured, short, stout, pointed; rhizoids well developed. *Ascus* clavate, with a pedicel of variable length, 90–100 × 17–21μ. *Spores* irregularly 2-seriate, elliptical, apiculate at each end, compressed, 10–15 × 9–10μ, olive-brown.

According to Zopf, the spores of this species on germination form chains of minute globose conidia produced at the tips of short lateral branches. These chains collapse and form a spherical head involved in mucus, which remains attached for some time to the tip of the branch.

Chaetomium indicum, *Corda*, Icon. Fung., 4, p. 38, fig. 104 (1840); Sacc., Syll., 1, p. 222 (1882).

This species has been met with at Kew, on damp packing paper from India, but cannot be considered as a British species.

Ceratostoma and Myxotrichum.

Ceratostoma Notarisii, *Sacc.*, Fung. Ven. Ser. ii., p. 308. This species is remarkable for the very long beak to the perithecium. It occurred abundantly on damp blotting-paper, and on damp cotton-wool, in Petri dishes in the Jodrell Laboratory.

Myxotrichum spinosum, *Mass.* and *Salm.* in Ann. Bot. xvi., p. 64. On decaying bark, in a Petri dish, Jodrell Laboratory.

Doubtful Species.

Chaetomium griseum, *Cooke* in Grev. 1, p. 175 (1873); Sacc., Syll. 1, p. 226 (1882).

Subgregarious or scattered, grey or cinereous, perithecium globose, brown, submembranaceous ; hairs long, elastic, circinate, pellucid, faintly and very rarely septate. *Asci* clavate, fasciculate ; sporidia lemon-shaped, colourless ; endochrome granular, or nucleate.

Hab. On old sacking, King's Lynn (*C. B. Plowright*). On old rag and paper, Highgate (*M. C. Cooke*).

The threads somewhat resemble those of *Chaetomium murorum*, but are stouter, less rigid, and more transparent, the sporidia are larger and colourless (·0004–·0006 × ·00025–·00035 in.)=·013–·017 × ·006–·009μ.

No type specimen exists, and judging from the above description, which is Cooke's original account of the fungus, the species is not likely to be recognised again. Furthermore, if the spores are colourless, the fungus cannot be a *Chaetomium*.

Explanation of Plate.

Figs. 1–4 ; *Chaetomium crispatum ;* 1, perithecium ; 2, the two forms of crown-hairs ; 3, ascus ; 4, spores.
Fig. 5 ; *Chaetomium murorum.*
Figs. 6–8 ; *Chaetomium pannosum ;* 6, perithecium ; 7, tip of a crown-hair ; 8, spores.
Figs. 9–10 ; *Chaetomium Kunzeanum ;* 9, perithecium ; 10, showing habit of fungus, nat. size.
Figs. 11–12 ; *Chaetomium comatum* ; 11, perithecium ; 12, ascus.
Fig. 13, *Chaetomium bostrychodes.*
Figs. 14–18 ; *Ceratostoma Notarisii ;* 14, perithecium ; 15, perithecium after the spores have been ejected from the perithecium and held in a mass by the crown-hairs ; 16, mouth of perithecium with reduced crown-hairs ; 17, ascus ; 18, portion of crown-hair.
Figs. 19–20 ; *Myxotrichum spinosum ;* 19, perithecium ; 20, network covering perithecium.
Fig. 10, nat. size, the remainder magnified.

XVIII.—A VISIT TO THE WEST INDIES

An invitation was received from the Imperial Commissioner of Agriculture for the West Indies, at the end of October, 1911, for a Representative of the Royal Botanic Gardens, Kew, to attend the Eighth West Indian Agricultural Conference to be held at Trinidad in January, 1912. This invitation was accepted by the Director with the sanction of the President of the Board of Agriculture and Fisheries, and I was deputed to attend the Conference as the Representative of the Royal Botanic Gardens.

The passage to the West Indies was made with the other British Delegates* in the R.M.S.P. "Arcadian," leaving England on

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* Mr. G. A. K. Marshall, Scientific Secretary, Entomological Research Committee, Colonial Office ; Messrs. J. W. McConnell and W. Marsland, British Cotton Growing Association, and Messrs. C. Sandbach Parker and E. R. Davson, West India Committee.

January 3rd, 1912, and we were fortunate in having Professor Carmody, Director of Agriculture, Trinidad, as a passenger on board the boat. The return journey was in the R.M.S.P. "Trent," reaching Southampton on February 19th. Through the kindness of the Royal Mail Steamship Company free passages to and from the West Indies were accorded to the British Delegates. Nearly twenty-two days were thus available in the West Indies. Barbados was visited on the way out and again on the return journey; the week before the Conference I spent in a visit to Dominica and the islands lying between it and Trinidad and the week after the close of the Conference in a visit to Palmiste, the estate of Mr. Norman Lamont, and in camping out in the "High Woods" of Morne L'Enfer in the southern part of Trinidad.

Owing to the forethought and kindness of the Imperial Commissioner of Agriculture, President of the Conference; the Director of Agriculture and the local committee in Trinidad; the Director of the Local Department of Agriculture, Barbados, and the Agricultural Superintendents and Curators of Botanic Stations, and many others in the islands visited, my stay in the West Indies was rendered particularly pleasant and profitable. My best thanks are due to all those who spared themselves no trouble in enabling me to utilise the short time at my disposal to the greatest advantage. It was with much regret that, owing to the shortness of time at my disposal, I was unable to accept a pressing invitation to pay a visit to British Guiana.

Barbados.

We were met on arrival at Barbados by Dr. Watts, and later Mr. Bovell and Sir Frederick Clarke, President of the Agricultural Society, came to take us ashore. The day was spent under their kindly auspices, in visiting cotton ginneries and the offices and experimental grounds of the Local Department of Agriculture. On the return voyage Dr. Watts conducted us over the offices of the Imperial Department of Agriculture and afterwards through the kindness of Mr. Collymore, took us for a motor car drive of some forty-five miles around the southern and south-eastern end of the island in the course of which the sugar mill at Spencers was visited and a very interesting general idea of the island and its extensive cultivation was obtained.

Cotton.—There are two flourishing Cotton ginneries situated in Bridgetown, one with three gins belonging to Mr. Thornton and the other, the co-operative factory, where about a dozen gins were working. Cotton of very good quality was being ginned at both factories and the work was being done on similar lines in each place. The cleaned seeds were also dealt with and after being crushed and heated the mass was pressed to extract the oil. The resultant oil cakes contain some five per cent. of oil and are either sold as cake or ground into meal. The oil undergoes purification until a high class, pale yellow oil is obtained very similar to olive oil and used for similar purposes. Both the oil and the cake produced in the island are disposed of locally. In both factories the cleanliness and airiness of the ginning rooms was a striking feature. The

various processes connected with the cotton industry are of particular interest since there is not a particle of waste material left over in the factory.

At the co-operative factory I had the further interest of seeing the cotton being baled by a powerful hydraulic press and the sewing up of the bales and the binding with steel hoops.

Under the guidance of Mr. Bovell the Experiment Station of the Local Department of Agriculture was then visited and the various plots of sugars, cotton, yams, &c., were examined. Among the cottons a good variety found near a native hut was being used for selection purposes and we were also shewn some diminutive plants as well as some tall specimens the offspring of a self-fertilized hybrid. Large numbers of sugar cane seedlings in the nursery were also examined. The gardens in and around Bridgetown were gay with *Caesalpinia pulcherrima*, *Bougainvillea*, *Hibiscus*, &c., and at Mr. Bovell's house a *Beaumontia* was in full flower, as fine a sight as a great white Himalayan Rhododendron. The small proportion of uncultivated and uncultivable land in Barbados as well as the dense population are the remarkable features of the island. Tilled ground planted with sugar, cotton, maize, and Guinea grass, stretches away on all sides, and around the native huts appear small patches of other produce such as tanias, yams, okras, cassava and papaws.

Sugar.—I was fortunate enough to see the commencement of the sugar manufacture and visited the mill at Spencers where sugar is made by the old Muscovado process. Many of the old mills in Barbados are still driven by wind power, but at Spencers the motive power is steam. The crushing mill which is hand fed is composed of a single pair of crushing rollers and the extracted juice is run off into the factory where it is limed, boiled and concentrated. The megass, that is the dry refuse cane from which the juice has been extracted, is laid out in the sun to dry and then used as fuel for the furnaces. In the boiling house the juice is evaporated in a series of open copper pans and kept stirred by negroes with perforated copper ladles on long handles, the thickening syrup being gradually ladled up from pan to pan and then at the right time run out in crystallising tanks. The sunlight streaming in on the bubbling golden-brown syrup in the burnished copper pans and lighting up the bronze negroes often stripped to the waist, with their long-handled ladles in constant motion produced a remarkably beautiful colour effect. The brown crystallised sticky mass consisting of sugar and molassses is then placed in a centrifugal machine which separates the molasses and leaves a beautiful finely crystalline cream-coloured sugar behind. This sugar which is quite dry is then bagged for export.

The pieces of sugar cane used for replanting the cane fields are taken from the tops of the old canes, a piece of stem about one to one and a half feet in length being cut off, which consists of several internodes. In the case of a long-cultivated variety such, for instance, as "White Transparent," it is often found in Barbados that no eyes or axillary buds are developed in the upper part of the cane or ratoon, and care has to be taken that such useless pieces are discarded before planting as no shoots can be developed from them.

The damage done by cane borers to the stools and roots of the canes was very marked in passing through the cane fields, both in the yellow colour of the leaves and the lack of vigour of the plants in fields badly attacked. It seems probable from specimens preserved in the offices of the Imperial Department of Agriculture that the beetle which is reported to be doing so much damage to sugar canes in Mauritius occurs in Barbados and may have been carried from the West Indies, but in Barbados apparently the damage which can be traced to its larvae is not very appreciable.

The sea coast of Barbados on the N.E. by Bathsheba is of considerable beauty and affords a striking contrast to the main mass of the densely cultivated portion of the Island.

The Windward Islands and Dominica.

On the outward journey Trinidad was reached on January 16th in the morning. The view of Trinidad and of the Bocas Islands with the outline of the Venezuelan mountains dimly seen through the early morning mist has often been described and is of remarkable beauty. The day was spent in Port of Spain where we were met on arrival by Mr. Freeman and in the course of the day I met most of the Officers of the Department and of the Board of Agriculture. After being very kindly received by His Excellency the Governor, I visited the Botanic Gardens with Dr. Watts, and later in the afternoon embarked on the R.M.S. "Balantia" for the Northern Islands. Owing to the kind arrangements made by Dr. Watts I was able to utilise the short time available in each island to the best advantage.

Grenada.

Grenada was reached soon after six a.m. on Wednesday, January 17th, and Mr. Auchinleck took me across the bay in the Government cutter to the Botanic Garden. The situation of St. George's, with its almost circular harbour is one of the most beautiful in the West Indies. The Botanic Garden is a charming spot prettily laid out and contains many fine specimens of exotic trees and palms. Here, as elsewhere, in West Indian Botanic Gardens the visitor receives a shock to his ideas about geographical distribution until he realises that the native vegetable products are almost unrepresented and that the plants around him have largely come from the Tropics of the old world. Kew no doubt is largely answerable for this condition of affairs and though by her introduction of the finest products of the East she has certainly added enormously to the beauty of West Indian gardens, yet one cannot but feel that the neglect of the native vegetation is to be regretted.

An addition to the Grenada Botanic Garden in the shape of a rather dry and rocky promontory has recently been made which would form an ideal spot for a collection of the more xerophytic types of native and exotic vegetation ; it is to be hoped that as full advantage of the possibilities will be taken as the circumstances permit. Not only is the garden a charming spot both by reason of its situation and the nature of its contents, but it also serves its purpose as a centre for the growing of economic plants for distribution. One small tree is kept as a home for scale insects and their

parasitic fungus, *Cephalosporium lecanii*, and the leaves are distributed over the island in order to spread the fungus which has resulted in keeping the *Lecanium* scale in check.

Useful work is being done in connection with the peasant agriculture by giving instruction in the country and by the establishment of small experimental plots as object lessons in different parts of the island. In this way it is hoped, not without reason, to raise the standard of the cultivation of the peasants' small holdings which are a very important feature of the conditions which prevail in Grenada. Ten thousand, three hundred acres are in the hands of peasant proprietors holding ten acres or less while 64,200 acres are held in estates or holdings of over ten acres.

St. Vincent.

Owing to the lateness of the hour at which the steamer arrived at St. Vincent on the outward journey and the early arrival and short stay on the return voyage, I was unfortunately unable to get ashore to visit the Botanic Station. The noble bay, with its forest-clad mountains and Georgetown half hidden among the trees and palms forms a view of great beauty from the steamer.

In St. Vincent the cotton industry is being conducted by Government on successful lines. The Government owns the Central Ginnery and purchases the cotton from the peasants, and the work is largely in the hands of the Agricultural Superintendent. In addition to this work and the care of the Botanic Station, there is the advisory work connected with the estates which entails a considerable amount of travelling about the island.

Here, as elsewhere, in the West Indies the multiplicity and diversity of the work which devolves upon the agricultural superintendents or curators strikes the visitor with surprise which is increased when it is seen how efficiently the various duties are performed.

St. Lucia.

St. Lucia was reached in the early morning and we berthed alongside for coaling. Castries being an important coaling station, has its beauty somewhat marred in consequence and the comparatively high wages which can be obtained from coaling operations render the natives indolent in agricultural matters. Here we were met by Dr. L. Nicholls and taken across a piece of low-lying ground to the Botanic Station which is partly situated on a reclaimed swamp at the end of the harbour. The situation is by no means a good one, but the gardens have risen superior to the site and possess several attractive features. Soon after my arrival I was met by Mr. Moore, who took me all over the station. The garden contains a good and interesting collection of exotic plants and a good nursery stock of economic plants for distribution. The nutmegs in full fruit, just bursting and exposing the crimson mace were among some of the most beautiful objects in the garden. The garden affords a fine spot on one side for a collection of West Indian ferns, but the funds at the disposal of the station are insufficient to allow of expenditure on the formation of collections of purely botanical interest.

Before rejoining the steamer a visit was paid to the market where a fair collection of native vegetables was displayed for sale, but owing to the time of year few fruits were being offered.

Lack of time unfortunately prevented a visit to Union where Mr. Brooks is in charge of the experiment station of some ten to fifteen acres in extent. The cultivation in the island is mainly in the hands of small peasant proprietors whom it is found difficult to rouse to any great energy.

On the return journey we arrived at Castries after dark and in the rain, so that no more could be seen of the island, and it was unfortunate that the famous Pitons of St. Lucia were not visible owing to our passing them at night both on the northward and southward voyages.

Martinique.

We passed sufficiently close to the northern end of Martinique to examine with the aid of glasses the condition of St. Pierre and the slopes of Mt. Pelee which had been swept by the eruption of 1902. The contrast between the appearance in 1903 when I landed near St. Pierre and went all over the site of the town and the condition of the spot in January last was very striking. The site of the town is now covered with vegetation, some plants being of a considerable height, and the slopes of the mountain itself are almost equally green. The deep cañon-like gorges cut by the water courses through the consolidated volcanic ash, however, are clearly visible with their barren grey cliffs and there are some delta-like patches of grey ash, probably washed down by the torrents, which were equally barren. Already some houses have been erected on the old site and the remains of the cathedral appeared to have been restored.

The changes brought about by time are doubtless quite comparable to those which have taken place on the Soufriere of St. Vincent recently described by Sands.*

Dominica.

The view of Dominica from the sea rising in lofty forest-clad mountains and cut by deep valleys is probably as grand a sight as the West Indies can afford, and the nearer approach only serves to heighten the beauty of the Island. Along the shores of the little bays or river mouths are groves of cocoanuts partly screening the native huts from view, while on the hill-sides the planters' houses with attendant royal palms are situated charmingly, and here and there a Bois Immortelle stands out as a patch of blazing colour in striking contrast to the many shaded greens of the dense forest. At Roseau I was met by Mr. J. Jones, Curator of the Botanic Station, and the Assistant Curator, Mr. G. A. Jones, and went at once to the Botanic Station situated at the back of the town.

The Dominica Station, with its stretches of vivid green turf of *Paspalum dilatatum*, studded with handsome well-grown specimens of trees of all kinds and with the forest-clad cliff of the Morne as a background, is undoubtedly the finest botanic garden in the West

* W. Ind. Bull., vol. xii, No. 1, 1912, pp. 22–33.

Indian Islands. It has a remarkable air of spaciousness, for the specimens are not crowded and a great deal of the charm of the spot depends on this as well as on the artistic manner in which the general arrangements have been made. The time of year was not very favourable for trees in flower and except for the mortelles which were alive with humming birds and for a small tree of the West African *Baikiea insignis*, with its striking white flowers, there was very little in the way of floral display. The experimental plots are conveniently placed along the valley, and as they are screened by a hedge do not interfere with the landscape effects of the garden.

Cacao.—The Cacao-grafting experiments, which have been carried out with such success by Mr. Jones, were of particular interest. The trees as yet are young but I was particularly struck by their low growing and spreading habit in contrast to the more fastigiate character of the bushes raised from seed. The grafted plant is produced from a lateral branch scion and may be compared in its growth form to a broad-based cone standing on its base, while the seedling resembles rather a cone standing on its apex. The grafted tree would appear to offer several advantages over the seedling, though it is sometimes asserted that we are not yet in a position fully to realise the value of grafting. (1) It makes it possible to have a plantation devoted to one variety of Cacao alone. This is a matter of considerable value since uniformity in the beans brought in for curing could be secured and a uniform product should result. At present, owing to the mixed crop comprising beans of different varieties, a good deal of difficulty is experienced in adjusting the time of fermentation and regulating the drying and curing processes, and as a consequence uniformity of the sample is often lost. (2) By using different varieties for grafting it would be possible to arrange a succession of plots ripening at different times and also the crop time might be slightly lengthened. (3) The habit of growth of the plant tends to shade the ground and so to prevent loss of water by evaporation. It would appear as far as can be seen that the picking of the pods would be a much easier process than it is in the case of the higher branches of the tall trees grown from seedlings, and that therefore injury from bad picking should be reduced to a minimum.

The question of "shade" or "no shade" for Cacao does not appear to be so burning a question as in Trinidad, nor does it seem safe to dogmatise for one island from experiences gained in another when conditions of climate and soil vary so much. But in any case it would be rash for a mere visitor to enter with hastily gleaned impressions into a field where veterans may have fought and fallen.

Some interesting hybridising experiments with Cacao were also in progress at the Botanic Station, and I saw sixteen plants of what appeared undoubtedly to be the result of an artificial cross between the Alligator Cacao, *Theobroma pentagona*, which has large beans, and a hardy variety of Forastero, *T. Cacao*. The experiment may lead to results of considerable scientific and economic importance, as it is hoped that by selection on Mendelian lines a useful variety may result. The value of mulch for Cacao and other crops was also well demonstrated in the experimental plots.

Cacao is grown up to about 1500 ft. on the sides of the valley and the plantations contain all types of Calabash and Forastero. The value of mulch for the health and vigour of the trees is constantly advocated by the officers of the station, and its effect in the island is well marked though on the steep hill-sides the application of dressings is by no means an easy matter. Clean weeding of plantations on the steep hill-sides is a great mistake since the undergrowth tends to retain the surface soil from being denuded, and on being mown over provides material for mulching the Cacao.

Much might be said of the various activities displayed at the Botanic Station. Space will only allow passing mention of the training of boys which is here carried out in a very efficient manner. Only a small number sufficient to meet the demand for overseers, etc., on estates are taken and they receive a sound practical and theoretical training.

Thanks to the kindness of Mr. G. A. Jones, who accompanied me, I was able to see as much as possible of the natural vegetation of the island by riding up to the heads of two of the beautiful valleys near Roseau. The luxuriance of the vegetation and its diversity are particularly striking, as well as the fact that the flora of each valley appears to be distinct in many important features. The tree ferns, twenty feet or more high, lend a peculiar charm to the scene in the higher parts of the valley, and one's pleasure was increased on finding *Utricularia montana* in flower on the banks at the top of the col.

A very good general idea of the western side of the island was obtained on the voyage to Portsmouth in the R.M.S.P. coasting steamer "Yare," which I made in company with Mr. J. Jones and Dr. H. Alford Nicholls. The steamer keeps so close in that the flora can easily be studied through field glasses and the xerophytic vegetation of the cliffs with Furcraeas, Mamillarias and species of *Cereus* as well as the components of the forest-clad hills can easily be distinguished and species in many cases identified. Some brown savannah-like areas are in striking contrast to the densely forested hills and are no doubt due, as Dr. Nicholls has pointed out, to the wanton destruction of forest and repeated burning which has led to extensive denudation of the soil. Portsmouth at the northern end of the island has a good harbour, which, however, is exposed to the south-west, and will no doubt gradually become a place of importance. At present it is not a healthy spot owing to extensive lagoons and swampy ground behind the town through which the Indian River runs. Since the bar at the mouth of the river has been removed and a properly arranged breakwater constructed, by the Dominica Forests Company which is exploiting the forests, conditions have been improved and a lowering of the water-level in the lagoons to the extent of about a foot has resulted.

Forests.—The forests on the hills near the town are now being worked for timber and a considerable trade in lumber is in progress. Unfortunately I was unable to visit the forests, but according to the "Memorandum on the Crown Lands in Dominica" presented by Mr. J. Jones to the Conference, and from what I was told in the Island, it is considered that the Crown has made all necessary reservations in connection with the rights

over 12,500 acres of forest land which have been recently granted to the Dominica Forests Company. River banks and watersheds are properly reserved and there are also large areas of the steep mountain sides impossible for plantations, but there is no Forest Officer in the island and we are in great measure ignorant of the trees composing the forests. It would seem therefore to be a matter of prime importance that the forests should be examined by a fully qualified officer and that regulations should be laid down as to the type and number of trees that may be cut and as to the proper age for cutting. Reserves also should be made, it would appear, not so much on general principles but rather in accordance with the character of the country on the results of a botanical survey, for it must be realised by anyone familiar with the island that its economic welfare is largely bound up with the proper conservation of the forests.

Our knowledge of the flora of Dominica is far from perfect, and as regards the trees we have perhaps more to learn than of any other type of vegetation. The information we do possess of the forest trees and of the value of their timbers is largely due to the efforts of Dr. Nicholls and Mr. Jones, but it is to be hoped that it may not be long before the flora and fauna of the island are carefully studied, a task which would be arduous, owing to the many mountains and numerous steep valleys, but would certainly yield results of great scientific interest.

Limes.—The principal industries of Dominica are the growing of Limes and Cacao. Rubber is being planted on estates in some parts of the island and there is a certain amount of cultivation in coffee, sugar, vanilla and minor products. The Lime industry appears to be in a flourishing condition and trees were very free from scale and blight largely owing to good cultivation. The lime juice is extracted and concentrated in the island before exportation. Before the limes are carted to the factory the oil is expressed from the rind by hand, and it is a common sight to see negro women sitting by the side of the path with an Iquelle, a small copper vessel like a cullender, at their side in which the lime is rubbed with the hand until all the oil is pressed out. The oil is collected into a vessel and the limes are at once taken to the factory. It is somewhat remarkable that no machine has been invented for extracting the oil, but the varying size of the fruits no doubt presents considerable difficulties. The women are able to deal with an enormous number of limes per day.

Owing to the difficult nature of the country and the loose volcanic rock of which much of the island consists and the heavy rainfall, the making of roads is a difficult task, and except on the flat land near Roseau there are no roads for wheeled traffic. Bridle paths leading through scenes of great beauty wind up the valleys and connect villages and estates, but transport is in consequence difficult and costly. Much land in the centre of the island, though suitable for cultivation, cannot be taken up owing to the lack of proper means of communication.

Museum.—At Roseau I was very kindly received by the Administrator and was taken by him to see the recently formed Museum, the success of which is largely owing to his great personal interest. The Museum had only been open to inspection for about three months, and the collections were necessarily small though very interesting in

character. Both in quality and arrangement they reflect the greatest credit on Dr. Nicholls, Mr. Agar and Mr. Jones, who are primarily responsible for the foundation of the Museum. Dr. Nicholls has lent his collection of Carib stone implements, which is probably unique in its size and variety, Mr. Agar has collected and arranged a large number of entomological specimens which should form the nucleus of an important collection, and the botanical exhibits are due to the activities of Mr. Jones.

Such a voluntary effort as the formation of this Museum deserves every encouragement, for there can be no doubt that as the collections increase and are accurately determined the value of the Museum to the community will be inestimable.

It was with many regrets that I had to turn my back on Dominica, which offers so stimulating a field to the naturalist owing to our comparative ignorance of its fauna and flora and which in addition possesses tropical scenery of such singular beauty.

Trinidad.

The Agricultural Conference.

Trinidad was reached in the early morning of January 23rd from the Northern Islands by the R.M.S. "Balantia," with a goodly company on board bound for the Conference. Kew was well represented by the Agricultural Superintendents, Curators of Botanic Stations, and Agricultural Instructors from the various islands. Soon after coming to anchor off Port of Spain we were met by the Colonial Secretary, the Hon. S. W. Knaggs, Mr. Freeman, Assistant Director of Agriculture, and Mr. Tripp, Secretary of the Agricultural Society, representing the local Reception Committee, and taken ashore in the launch, picking up the Delegates from British Guiana and Barbados from their respective ships on our way.

The Conference was declared open at 1.30 in a speech of welcome from His Excellency the Governor, Sir George R. Le Hunte, G.C.M.G. The President then delivered his address, and was followed by Professor Carmody, who gave an account of agricultural progress in Trinidad and Tobago. A Reception at Government House by His Excellency and evening lectures completed the first day's work.

As the Proceedings of the Conference will be published in full in the West Indian Bulletin, I do not propose to give any detailed account of the papers and discussions. Our time was well arranged, and a great deal of work of a very interesting character was done during the week that the Conference was sitting.

Early morning demonstrations from 7.30 to 8.30 at the St. Clair experiment station formed some of the most interesting and useful features of the Conference. Mr. Guppy demonstrated his methods of trapping Cacao beetles by using pieces of branches of the wild chataigne, *Pachira aquatica*, a tree which is very attractive to the beetles, and he pointed out the danger of growing it near a Cacao plantation. Then followed a demonstration by Mr. Rorer on the spraying of Cacao, showing the value of different types of nozzle; suitable forms of apparatus for use on hilly plantations were also

exhibited. Demonstrations of tapping of *Hevea* and *Castilloa* were given by Mr. Collens and Mr. Evans, and methods of coagulating the latex and smoking the rubber were also explained. This demonstration was of particular interest in connection with a very able lecture on Rubber Cultivation delivered by Dr. Cramer, Director of Agriculture, Surinam, whose presence at the Conference as representative of Surinam was highly appreciated. Dr. Cramer drew upon his wide experience of rubber cultivation in Java and spoke strongly against the policy of clean weeding except in very exceptional situations. The necessity of a covering to the ground on hillside plantations was forcibly insisted upon, as also the necessity of liberal mulching, and there can be no doubt from what I was able to see of Cacao plantations in Dominica and Trinidad that the same remarks undoubtedly hold good in the case of Cacao.

The subjects for discussion at the Conference were allocated to special days or half days, Cacao, Cotton, Sugar and Rubber being among the most important and interesting. There was not always sufficient time to exhaust the subject under discussion as the number of papers presented to the Conference was very large.

A suggestion was brought forward that the Conference might be broken up into sections dealing with different products, but the plan would seem hardly advisable since the majority of the delegates are interested in all or almost all the subjects brought up for discussion, and it is essential that those who have to advise on agricultural matters in the various Colonies should keep themselves in touch with the latest views on the various subjects which are embraced under agriculture. It would no doubt be possible to relegate the more purely scientific questions relating to Mycology, Entomology and Chemistry to subsections of experts as was done to some extent at this Conference, and it might also be considered desirable to remove papers concerning agricultural education from the programme of the whole Congress. But as the matter is receiving the careful consideration of the Imperial Commissioner it would be out of place for me to dwell on the subject at greater length.

Cacao.—The discussion on Cacao turned chiefly on the fungoid and insect diseases to which this crop is subject. Mr. Rorer demonstrated that both the pod rot and stem canker of Cacao is due to *Phytophthora Faberi* in a convincing manner with the help of a beautiful series of photographs and living specimens in which he showed the disease passing back into the stem through the stalk of the diseased pod. The value of spraying as a control of both insect and fungus attacks was also strongly advocated. Mr. Guppy dealt especially with the insect attacks and Mr. South presented a useful paper in which, among other things, he cleared up the somewhat involved nomenclature of the various fungoid pests.

The value of grafted Cacao was also discussed and the general feeling appeared to be that the experiments had not yet been seen on a sufficiently large scale or for a sufficiently long time for their merits to be properly appreciated. This feeling may possibly be due to the fact that the Dominica plots had been seen by only a few of the members of the Conference. In the course of the discussion I was glad to have the opportunity of expressing the very favourable opinion I had formed of the value of Mr. Jones'

work with grafted Cacao and pointed out the advantages which might be anticipated from the adoption of this method on a large scale. (*See* p. 172.)

Professor Harrison exhibited a series of beautifully executed water-colour drawings by Miss van Nooten of the pods of the different varieties of Cacao from trees cultivated by the Department of Science and Agriculture, British Guiana, which are to be presented to the Royal Botanic Gardens, Kew, and will form a valuable addition to the standard collection of illustrations of the different types of Cacao in cultivation.

Some interesting Cacao pods of the Forastero type were shown at the Agricultural Show by Mr. R. S. Reid of King's Bay, Tobago, and have since been presented by him to Kew. They were obtained from plants raised from the seeds of trees over 200 years old still growing in Tobago which were probably planted by Dutch settlers. Mr. Reid writes of the finding of the trees as follows :

"In 1906 I went with a native as guide up the Louis D'or River (two miles from King's Bay, Tobago), for about three miles and then scrambled up a tributary ravine until the 'Woods Cacao' (as the natives call it), was reached. There were about a dozen trees in a clump, surrounded by forest trees, from 50 to 100 feet in height and the Cacao trees appeared like huge palms with a crest of branches at the top. Seeds had dropped and the young seedlings were like fishing rods from 40 to 50 feet long, bare but for a few leaves on top, A few pods were on the trees—perhaps three on each at most. As they were not ripe, I sent a native a couple of months later to gather them and he brought down five pods. Three of these were sent to the late Mr. I. G. Haynes, St. Clair Avenue, and from bamboo cups he transplanted a number of the plants in his garden and it was from these trees that the pods on the Tobago Planters' Association Stand at the Exhibition, were gathered."

During the Conference week I visited the Government River Estate with Professor Carmody, Dr. Watts and others, and went through the extensive Cacao plantations.

Experiments are being conducted as to the value of "Shade" and "No shade," and in some cases the treatment seems rather drastic as the Immortelles, which had been planted fairly thickly and had formed a regular canopy over the Cacao, had all been removed at once with the result that in such cases the bushes had suffered to a considerable extent. Gradual removal of shade does not seem to be attended with harmful results, and if lines of these trees could be left at frequent intervals to act as wind breaks it might be found that the rest of the shade could be dispensed with to advantage.

On Lord Glenconner's estate at Ortinola which I had the good fortune to visit under the guidance of Mr. W. J. Bain, I noticed comparatively little shade, but such shade trees as were grown were lopped freely for mulch. A free growing leguminous tree without prickles on the stem would be the most useful kind of tree for the purpose of affording partial shade as well as for providing mulch. The River Estate plantations are mainly on flat or gently

sloping land, but at Ortinola much of the land is on steep hillsides. The value of mulching was thoroughly appreciated both at River Estate and Ortinola, but its importance on the latter plantation was particularly noticeable.

The cultivation at Ortinola was very good and the general health and fruiting of the trees was in striking contrast to those on the adjoining estate. Mulches of all kinds, such as Heliconias, grasses, branches of shade trees, etc., were freely used and the effect on the soil was most noticeable. Under the mulch it was soft and friable with the Cacao roots pushing up into it, while at the sides of the drains it was a stiff clay. The important part played by earth-worms in these tropic soils is very marked and their value was fully recognised.

Clean weeding is not practised, but on the other hand a covering of weeds, ferns Tradescantias, etc., is encouraged especially on the steep slopes, and such weeds are mown over from time to time. The Cacao hulls are limed and covered over with leaves and in course of time also serve as manure. The crop at Ortinola was a remarkably fine one and few sights of the kind are more beautiful than that presented by an extensive view in a Cacao plantation where the stems and branches are thickly covered with the rich crimson or golden-yellow pods, where the eye gets lost among the maze of laden stems and branches stretching away beneath the canopy of foliage.

Another question which exercises the minds of Cacao planters is that of "chupons," whether one, two, several or none should be allowed to grow. The "chupon" is a strong shoot such as we welcome in a rose tree for instance, and may spring from below the ground or from the main stem or from a branch. At River Estate there are plots occupied by fairly old trees where one, two, three or more chupons are being allowed to grow and a plot where all chupons are removed is also kept under observation. The results will be published in course of time, but from what could be seen at the Government plantations, Ortinola and elsewhere, it would appear that no hard and fast rule can be laid down on the subject and that the condition of each individual tree must be taken into consideration before deciding whether it may be necessary to encourage the growth of one or more chupons and as to which should be allowed to grow to the best advantage. In the case of an old tree whose stem has largely lost the power of producing flower buds, it is obviously sound policy to encourage the vigorous "chupon" and in course of time to allow it to replace the parent tree entirely. Similarly the "chupon" may be encouraged where it is necessary to replace a broken branch or to fill up the leaf canopy of the tree.

The fermentation, drying and polishing of the Cacao was also seen at River Estate; the latter process is delightfully primitive, being effected by the coolies and negroes who dance on the beans with bare feet in the blazing sun on the top of the drying sheds. A certain amount of clay is mixed with the beans before the dancing commences and the polishing, which cannot apparently be done by machinery, tends to preserve the beans and also enhances their value on the market. By some claying is not considered

necessary, but by others its value for the preservation of the beans is held to be all important. The polishing process takes from ten to twenty minutes. Owing to the different varieties of Cacao in Trinidad both of Calabash, Forastero and Criollo, which may be growing in the same plantation, a very mixed sample of beans may be brought in and this adds considerably to the difficulties of properly regulating the fermentation and may often result in spoiling somewhat the grade of the product. Plantations true to type would be of immense benefit to the industry, but except by grafting such an end does not appear to be possible.

Sugar.—This proved to be an inexhaustible subject of discussion, such well-worn topics as the value of seedling canes over the Bourbon and White Transparent varieties receiving their due share of attention. The possibility of making experiments on Mendelian lines with Sugar cane was raised by Mr. South, who presented a paper on "The application of Mendelian Principles to Sugar cane breeding," but the suggestion was considered impracticable by many of the delegates. So little is known at present as to the essential botanical characters* of the various types of cane or of the probability of such types breeding true that it is clear that much time must elapse before any tangible results can be obtained. Under present conditions it is not easy to see where such work could be done or what officers could find the time to conduct a series of arduous experiments, but nevertheless both as regards Sugar and Cotton it would seem highly desirable that Mendelian experiments should be started on a proper basis. An experimental station would have to be established and equipped with duly qualified officers, who should be allowed to pursue their investigations and researches without the distractions of advisory and routine work and without fear of constant interruption from members of the commercial community eager for results.

At present, therefore, the methods of selection now in operation must be continued though no fixity of type can be assured. Nowhere are such experiments being conducted with greater care than in British Guiana, and the work of the Agricultural Department in that Colony is deserving of the highest praise.

A series of beautiful water-colour drawings by Miss van Nooten of the different types of Sugar cane cultivated by the Department of Science and Agriculture, British Guiana, was exhibited by Professor Harrison in illustration of his remarks on Sugar cane problems. The drawings are of great practical use and would prove of considerable value in any work which might be undertaken in the future as a record of varietal characters.

Mr. Urich dealt with the various insect pests and pointed to the need of co-operation between Demerara and the Islands, with regard to investigations in connection with the encouragement of natural enemies and the application of remedial measures, a

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* In a paper presented to the Conference Mr. Sahasrabudde put forward the view, as the result of his investigations, that the different types of axillary buds offered a useful character for classifying sugar cane varieties, but the hypothesis did not appear to be sufficiently well proved though it may be found eventually to be capable of application.

suggestion which is equally applicable to questions affecting diseases due to Fungi, and one from which if adopted excellent results may be anticipated in the future.

Sugar is still the dominant crop of Trinidad, Demerara and Barbados, and there has been a very large expenditure in the remodelling of factories and in their equipment with the latest types of machinery, but on some estates at least it would appear that greater attention should be given to the improvement of the actual cultivation of the canes and to questions of crop rotation. These most important matters are occupying the serious attention of the Agricultural Departments and nowhere more so than in British Guiana, and I gathered, were beginning to receive due consideration on some of the large estates around San Fernando in Trinidad.

When staying with Mr. Norman Lamont at Palmiste during the week after the Conference, I paid a visit with him to the Usine St. Madeleine, a very large factory fitted with all the latest machinery for the manufacture of sugar. Unfortunately it was not in working order, but under the guidance of the engineer I made a thorough examination of the various machines and apparatus connected with the making of the sugar and also for the distilling of rum.

On the following day Mr. Lamont kindly took me to see the smaller factory of Malgré Toute, near Prince's Town, and I was able to follow the whole process of manufacture by modern machinery which afforded considerable contrast to the Muscovado process seen in Barbados. Here oil fuel was being used in addition to megass and the use of petroleum will no doubt increase largely in the course of a few years. The megass will then tend to become a product, for which there will be no use in the factory, and already it is being used near Port of Spain for making a good tough brown paper, and it may also be found profitable to return it to the land as manure. Though the season was later than usual owing to the absence of rain I was fortunate in being able to see the harvesting of the cane, the preparation of sets for replanting and the most approved process of sugar manufacture.

Cotton.—The present position and possible improvements in the Cotton industry provided an interesting morning's discussion, especially as the representatives of the British Cotton Growing Association were present and expressed their views. Mr. McConnell had spent most of the previous week in St. Vincent and was therefore able to bring his expert knowledge to bear on the problems affecting the Cotton industry in the West Indies. He mentioned that there had never before been a fine cotton so strongly grown as that now being produced in the West Indies, but he also pointed out that it was essential that the staple should be regular.

Nep or weak places in the cotton apparently due to weakness of fibre is common in West Indian Cotton and is a serious defect which lowers its value. In selecting cottons attention should be devoted to eliminating those with weak fibres. In the course of the discussion it was brought out that the condition of the lint depended to some extent on cultivation and that the proper development of the cotton was largely a factor of nutrition. In cotton generally there is a tendency for the lint to be collected at one end of the seed rather

than to be evenly distributed, and it would appear that in those types in which a dense apical development of cotton obtains a greater proportion of weak lint results. This may probably be due to the crowding of the fibres preventing the possibility of many of the hair cells receiving their proper share of food and allowing only a certain proportion to attain their full development. A possible remedy for such a condition of affairs would appear to be to select cottons showing the greatest tendency to a uniform distribution of the lint over the whole surface of the seed, and Mr. Bovell stated that in Barbados this point received particular attention.

A great deal of careful work is being done in the attempt to produce better and more stable varieties, and the work of Mr. Thornton of Tobago is deserving of very high praise. It seems possible that in course of time it may be found that West Indian Cotton is amenable to treatment on Mendelian principles as the work of Leake and Balls tends to prove is the case for the Indian and Egyptian varieties. Here again there is the need for ascertaining the exact botanical characters of the numerous varieties and of establishing as soon as may be a definite collection of types for purposes of reference. At present though much useful work has been accomplished the selection of cotton is largely empirical, the parentage of the hybrids is usually unknown, crossing with indifferent native types is liable to take place and there is thus always a tendency to deterioration. Cotton breeding work, to be of permanent value, would appear to require a station set apart where it could be carried on to completion without fear of disturbance.

An important and interesting paper on the Cotton boll weevil of Mexico and the United States was read by Mr. Ballou, and the gradual spread of this pest eastward was graphically demonstrated. As only some 450 miles of country remained in 1910 between its present most easterly station and the Atlantic the possibility of its introduction into the West Indies is becoming a grave one. Precautionary measures were advocated, and it was pointed out that provided it does not invade the islands West Indian Cotton is likely to benefit by its spread in the United States owing to the reduction that will take place in the yield of Sea Island Cotton.

Papers were also read by Mr. Sands in which an account was given of the careful manner in which the Cotton industry is being fostered in St. Vincent, by Mr. Tempany on the Cotton industry in the Leeward Islands, and by Mr. Robson on Cotton selection in Montserrat.

Rubber. Rubber formed the subject of an early morning demonstration at St. Clair, and also occupied the attention of the Conference during a morning's sitting. The delegates had the opportunity of hearing the views of Mr. Pearson, Editor of the "Rubber World," on the subject, and also of Dr. Cramer, whose evening lecture on Rubber Cultivation, illustrated by a magnificent series of slides, was very highly appreciated. Para, Ceara, *Castilloa* and *Funtumia* rubbers have been planted in the Islands and in British Guiana, but according to the general consensus of opinion Para rubber is the only one likely to prove of commercial importance. The Central American *Castilloa*, though it grows vigorously, offers very serious difficulties in tapping, and there is great uncertainty

as to the actual species in cultivation and as to their capacities for yielding latex. Moreover, the tree tends to be a harbourer of scale and blight, and as Mr. Pearson puts it, "it is the most provoking weed that was ever sprung upon mankind."

Funtumia elastica has been largely planted in Trinidad and I met with several plantations in the South of the Island, but it seems doubtful whether it will yield results commensurate with the expectations that have been formed of its value. When planted far apart as I saw it on one estate the young plants were growing like coffee bushes. Close planting produces trees with more definite stems, and it may be that it is as yet too early to form a proper opinion as to the future of this plant in the West Indies.

With Para rubber the West Indies have to labour under the difficulty of importing seed from the East without definite knowledge as to the character and latex-producing powers of the trees from which they have been obtained. There is thus always a danger that trees which yield seeds quickly may not be the best latex producers. Two old trees of true *Hevea brasiliensis* have recently been discovered in a wild portion of the Trinidad Botanic Gardens, and careful experiments as to the latex production of these trees and of other undoubted Para rubber trees in the experimental plots are being made so that before long the island will possess accurate data as to the yield of its own trees from which a supply of seeds will be available.

Despite the somewhat low rainfall of Trinidad, which in the past year was considerably below the average, Para rubber appears to flourish, and I saw some promising young trees on one of Mr. Lamont's plantations at Palmiste. Ceara rubber and the other Manihot rubbers find but little favour in the West Indies, and it seems that the rubber industry generally will always be pursued under more difficult conditions than in the East owing to the lack of cheap labour and the difficulty of obtaining experienced tappers.

Cocoanuts.—The Cocoanut industry is rapidly rising in importance as an object of agricultural activity in the West Indies owing to the good prices which are being realised for nuts and copra. Flourishing plantations exist on the windward side of Trinidad, and others are being established at various places around the coast. At present the demand for nuts for planting is far in excess of the supply.

The diseases of Cocoanuts due to insects and fungi occupied the attention of the Conference. The Bud-rot disease described by Mr. Rorer is a serious parasitic disease of bacterial origin and is prevalent in Trinidad, and great care is being taken to destroy all trees affected by the disease. Mr. Urich dealt with the numerous insect pests, the most serious being the beetles which bore into the stems. Insects no doubt also aid in the dissemination of the Bud-rot fungus. Manurial experiments with Cocoanuts have been started under the control of the Board of Agriculture in Trinidad and Tobago but no results have yet been published.

An account was also given by Messrs. Tempany & Jackson of the experimental planting of Cocoanuts in Antigua, from which we learnt with pleasure that a fair measure of success is anticipated as this crop would form welcome minor industry in the Island.

An object of particular interest which was shown at the Conference by Professor Harrison was the first fruit of the Coco-de-mer of the Seychelles which has ripened on the young plants in the Botanic Gardens at Georgetown, Demerara,* raised by Mr. Waby.

Other industries to which the attention of the Congress was directed were as follows :—

Limes, which are a staple industry in Dominica and are now becoming a crop of importance in Antigua.

Sweet Potatoes.—This product formed the subject of a useful paper by Mr. Robson in which he dealt with the attempts he has made to classify the varieties of sweet potatoes in Montserrat. The paper was illustrated by a large number of specimens illustrating the different characters of foliage and tuber on which the classification is based.

Bay Rum.—The bay rum and bay oil industries of St. Thomas and St. Jan were described by Mr. Fishlock, and it was suggested that there might be an opening for a moderate trade in bay oil and dry leaves of the best quality from the English Islands to St. Thomas.

Mycology and Entomology. A committee was appointed consisting of the scientific officers in the various colonies with Mr. Marshall and myself as members under the Chairmanship of Mr. Marshall to consider questions relating to difficulties connected with the nomenclature and identification of fungus and insect pests. It was suggested that intercourse between the workers in the different colonies should be fostered by correspondence and that specimens should be exchanged in order that agreement may be reached as to their proper scientific and popular names. Also that in the case of Fungi specimens should be deposited at Kew and references of any difficulties should be made to that institution. The Entomological Research Committee to be the referee for insects. It was further suggested that facilities should be given for the scientific officers of the various Agricultural Departments to meet informally in one or other of the Colonies, and that if possible such meetings should take place annually. By meetings of this kind and by the interchange of specimens it was considered that the interests of scientific work would be furthered and that the spirit of co-operation thus encouraged would lead to greater efficiency and usefulness in the Agricultural Departments of the different Colonies. Moreover, such co-operation should tend to prevent unnecessary overlapping in mycological and entomological investigations.

An afternoon session was also devoted to the discussion of matters relating to Agricultural Education, but as this account does not profess to be exhaustive I must perforce refrain from dealing with so wide a subject and also from referring to many other matters of interest which were brought before the Conference.

Forestry in Trinidad.

Although Forestry questions were brought to the notice of the Conference on the last morning, I deal with the subject apart from

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* See *Kew Bulletin*. 1910. p. 256.

the Conference as, besides listening to the interesting paper by Mr. Rogers, the Forest Officer of Trinidad, he most kindly took me to see his experimental plantation at Arima and also to spend two nights in the Forest Reserve of Morne L'Enfer in the southern hills.

Mr. Rogers is working in Trinidad with only native foremen and overseers ; but for the carrying out of plantation work and forest conservation on an adequate scale, there is need of an enlargement of the European staff.

On the visit to Arima we were accompanied by Mr. Waby, Head Gardener of the Botanic Garden, Georgetown, Demerara, and much appreciated his wide knowledge of the flora. Here as elsewhere in Trinidad, Cedar (*Cedrela odorata*, L.), Cyp (*Cordia Gerascanthus*, Jacq.), Honduras Mahogany (*Swietinia macrophylla*, King), and Poui (*Tecoma serratifolia*, Don), are the trees most extensively planted.

Great care is being taken in the matter of seed selection, and the seed of only those trees which show a clean, straight trunk without tendency to forking and low branching is used for plantation work. The young trees I saw in the plantations bore out the wisdom of this policy, as they were in all cases forming vigorous clean main stems.

Before planting the forest is cleared of useless timber and the young trees are placed in lines twenty feet apart. The secondary growth is allowed to spring up between the lines, the young trees being kept clear. This treatment encourages their proper development and also the damage from pests and fungi is minimised. The trees at Arima were either sown at stake or planted from nursery beds, but in both cases the percentage of success was very high.

The visit to the forest of Morne L'Enfer was particularly interesting and it was entirely owing to the kindness of Mr. Rogers, who altered all his plans, that I was able to spend my last days in the Island in the heart of the forest. My best thanks are also due to Mr. Collignon, who was felling Cedar and Balata in the forest, beneath whose elegant " Ajoupa " we had our quarters.

Our way to the forest led across the famous Pitch Lake, so well described by Kingsley. A remarkable amount of vegetation comprising Cashew bushes, ferns and herbaceous plants appears to be growing actually on the surface of the pitch, but is doubtless rooted into soil which has collected in the cracks and fissures which occur over the surface of the asphalt. These islands of vegetation appear in strange contrast to the black waste of pitch. Owing to the discovery of oil in the heart of the forest a good cart track has been cut into the Morne L'Enfer Reserve, and we were able to drive to Mr. Collignon's Ajoupa in its very midst.

Here we found a beautifully constructed shelter roofed with the fan leaves of the Carat or Sabal Palm. The roof had a wide span and we slung our three hammocks beneath its protecting shelter in the greatest comfort. To add to the enjoyment of the experience there was a full moon and the scene in the forest at dead of night with the beams of brilliant moonlight here and there piercing the dense canopy overhead and lighting up the trunk of some great palm or illuminating the depths of the forest was one not easily to

be forgotten. Mr. Rogers was busily engaged in measuring the felled and squared logs of the fragrant Cedar (*Cedrela odorata*). These trees are distributed on an average of about three to every two acres ; usually they have a clean trunk some 60 feet high with great flange buttresses at the base springing from the trunk about ten feet above the ground level. The trees are felled with axes and are cut down just above the tops of the buttresses. The trunk is cut into logs which are squared in the forest and then dragged out by oxen and sent by water to Port of Spain. The squaring of the logs is done entirely by hand with axes, and there is a sad waste of wood, not only in the unfelled buttressed portion and upper part of the trunk, which is considered too small in diameter to carry out of the forest, but also in the wasteful process of squaring the logs. Moreover, the trunks often crack with the violence of their fall and the wood tends to split badly owing to the lack of seasoning. It is difficult to understand why the logs should not be dragged out in the round, but apparently questions of transport and other matters render it impracticable. The Balata trees are being felled for railway sleepers.

From the tops of the felled trees I was able to bring home a fair collection of orchids, but as only Cedar and Balata trees were being felled I found that I had soon exhausted their epiphytic flora and it was only when some other kind of tree was brought down in the general wreck that I could add new species to my collection. A fine plant of Vanilla, climbing to a height of 40 feet up the trunk of a forest tree, with huge leaves and a stem of almost an inch in diameter, was noticed. Among the most beautiful objects in the forest were the Manáques (*Euterpes*) with their slender trunks some 60 feet high and graceful crowns of leaves. Other palms were abundant, such as *Attaleas* loaded with Aroids, the Black Roseau (*Bactris*) with its long evil spines, the Carat (*Sabal*), and in damp places the Timite (*Manicaria*) with its seeds closely resembling those of the vegetable ivory palm. Other beautiful objects were the Browneas in full flower like a gleam of flame in the somewhat dim light of the forest, and the scarlet bracts of *Warscewiczia coccinea*, which almost equalled the Browneas in glory though they were far less common. Young seedling Cedars were met with occasionally in the forest, but middle-aged trees were rare.

In the Morne L'Enfer Reserve, though a great deal of felling has taken place, there has been no attempt made to plant up the clearings, and the forest is rapidly becoming of less value as a source of timber. It would not be possible, however, for fresh schemes of planting to be undertaken without an increase in the Forestry staff. But it would appear to be sound policy to plant up cleared areas with useful trees such as Cedar, and so to maintain the forest as a source of revenue to the Island.

Among other Forestry enterprises which deserve mention are the Mahogany plantations at River Estate and elsewhere in Trinidad. The species planted is usually *Swietinia macrophylla*, but there appear to be two distinct species grown in the Island in addition to the native small-leaved West Indian variety. One of these with leaves intermediate in size between those of the other two species may possibly be an undescribed form.

Logwood is also grown in the Island, and I saw Mr. Lamont's flourishing plantation near Palmiste which was a particularly beautiful sight at the time of my visit as many of the trees were in full flower and the air was laden with their scent.

Entertainments and Excursions.

The Conference by way of properly adjusting the balance between business and pleasure, and also of giving opportunities for that social intercourse among its widely-separated members which is one of its most important functions, indulged in several festive entertainments and excursions. Most of them, however, were combined with opportunities for practical instruction and observation.

His Excellency the Governor most kindly entertained the Delegates at a Reception at Government House and also to dinner.

The Conference dinner was held on the Saturday evening and was honoured by His Excellency's presence. It was a great function and was attended by the members of the Reception Committee and others in Port of Spain who had done so much to make our visit a success. In the course of the speeches the thanks of the Delegates for all the kindness shown to them in Trinidad were suitably expressed.

The excursion to the River Estate has already been mentioned under the subject of Cacao. Arrangements were made to drive us to the Estate and from point to point, so that as much as possible might be seen, and on the return journey we were most kindly entertained to tea at the Boys' Reformatory, where we were received by His Lordship the Bishop of Trinidad, and afterwards shown over the Institution. The boys were all being taught useful trades connected with agricultural pursuits and were doing good work, and the whole of the arrangements of the Institution appeared admirable. On the same day other visits were paid to places of interest near Port of Spain under equally pleasant conditions.

Professor Carmody entertained the Delegates at Government Farm on the Saturday afternoon and an opportunity was thus afforded of seeing the Government stock and the various experiments in progress.

One excursion, however, was unique in character and has no parallel in the history of these Conferences. By the invitation of the Hon. Thomas Cochrane we were enabled to visit the Trinidad Oil Fields at Port Fortin, Guapo, and to see something of the great possibilities which may be realised by Trinidad as an oil producing country. His Excellency the Governor was of the party, and we made our journey to the south end of the Island in the R.M.S. "Balantia" which had been chartered by our generous host. On coming to anchor we were landed in small boats and proceeded to the wells partly on foot and only partly by the Company's gaily decorated railway trucks, owing to certain small accidents which fortunately had no untoward results. The day was most instructive and interesting as affording an idea of the great natural resources of Trinidad in the way of oil; but to the botanist and lover of things beautiful the tall derricks, often black and slimy with oil, rising among the wreck of tropical forest, the ground in many places covered with black petroleum, and the shanties, machine sheds and

railway lines suggested the very abomination of desolation standing in the place where it ought not.

As one walks in the forest near these oil wells, and also in the Morne L'Enfer Reserve, dome-like masses of pitch may be met with, and black oily matter may be seen oozing gently from small fissures among the shales in the heart of the forest.

It is clear that Trinidad possesses a vast source of mineral wealth in this southern region, which, provided it can be economically worked, will prove of immense value to the Colony and to our other West Indian possessions whose fuel at present is imported coal.

The Agricultural Show.

At the conclusion of the Conference interest in agricultural affairs was maintained by the Agricultural Show held in Port of Spain under the auspices of the Agricultural Society, which was opened by His Excellency the Governor. The Society generously presented all the Delegates with free passes and invited them to a special private view of the show, a privilege of which they gladly availed themselves. I can only allude here to the remarkably fine exhibits of Cacao from Trinidad and Tobago, to the interesting collection of Citrus fruits of all varieties shown by the Agricultural Department, and to the numerous exhibits of native fruits and vegetables. Mr. Caracciolo had a stall of economic plants and showed methods of packing. There was also an exhibit of Silk-worms, and from the flourishing condition of the caterpillars and the excellence of the silk it would appear that there is no reason on cultural grounds why this industry should not successfully be established in the West Indies.

The horticultural side of the show was disappointing and a fine plant of *Coryanthes* in flower was the most interesting exhibit.

The Botanic Gardens.

The Botanic Gardens of Port of Spain are so well known and their beauties have been so often described that it is not necessary to refer to them in any detail.

The collection of trees and shrubs contains a great number of interesting specimens and is especially rich in plants of economic importance. There are also many trees and shrubs of purely botanical or horticultural interest and two trees of *Amherstia* and a very fine *Camoensia*, which were in full flower at the time of the Conference, deserve special mention, as do also the collections of Palms and Bamboos.

The situation and natural features of the Gardens are delightful embracing as they do both hillside and valley with much uncultivated ground intersected by winding paths. A lack of spaciousness and landscape effect is noticeable in certain parts which prevents many of the fine trees from being seen to their full advantage. Of these defects Mr. Freeman is fully cognisant and before long no doubt considerable improvement will be effected.

The Experiment Station at St. Clair close by, which is also controlled by the Department of Agriculture, is well stocked with

economic plants in experimental plots, and much useful work is being done not only in the way of testing different varieties, but also in providing plants for distribution.

In the grounds of the Station is situated the building containing the Trinidad Herbarium, in which the late Mr. Hart took so keen an interest; and in the upper rooms the officers of the Board of Agriculture have their not very spacious headquarters.

Conclusion.

The account in the foregoing pages of Botanical and Agricultural enterprise in some of the West Indian Islands is of necessity but an impressionist sketch, the result of a hasty visit. Nevertheless, I venture to think that the impression of sound and useful work which I gained and which I have attempted to depict is a perfectly accurate one.

My sketch, however, would be sadly imperfect did I omit to refer more particularly to the work of the Imperial Department of Agriculture. The centralisation of the small local departments so successfully achieved by Sir Daniel Morris has been the means of helping forward very materially the general prosperity of the smaller islands, and the continuation of the work of the Department under Dr. Watts has been marked with equal success.

The Imperial Department has been the means of stimulating with helpful suggestions the lines of experiment suitable for the several islands and has also been able to procure materials and provide information which it would not have been in the power of the separate organisations to obtain. Some of the West Indian Colonies have found themselves strong enough and rich enough to be able to maintain independent Agricultural Departments, but they are at the same time in a position to avail themselves of the work done by the officers of the Imperial Department, just as the latter is ready and eager to make the best use of the researches undertaken by those Departments outside its immediate control.

In such a region as the West Indies where the problems awaiting solution are common to all it is clear that the only sure way to progress is by a federation of scientific interests, not necessarily by means of tangible bonds or definite agreements, but by a cordial spirit of mutual co-operation and friendly intercourse. Such a spirit it would seem can be best fostered by the opportunities for the exchange of ideas and the free and friendly discussion of difficulties which are afforded by the Agricultural Conferences.

Finally, I must, "as in private duty bound," allude to one matter which struck me very forcibly. In most of the islands the Agricultural Officers have been sent out from Kew, after serving their term of two or three years as young gardeners, to take up their respective duties. In a few cases the officers have not been trained at Kew, but my remarks apply equally to the good work they also are doing. The work which has fallen to the hands of all these officers is of the most varied character, and frequently of a type of which they have had no previous experience. I found them acting as buyers and sellers of cotton for Government, as teachers in agricultural schools, curators of gardens, devisers of experiments,

agricultural instructors, &c., besides which they are expected to have an expert knowledge of Botany, Forestry and many other subjects. In some islands most of the above functions appear to be centred in one and the same individual, and it was a matter of considerable satisfaction to find that they were fulfilling their various occupations with great credit to themselves and to the no small advantage of their respective communities. It would be invidious to refer to special cases, but it seemed to me that the valuable services of the Agricultural Officers were not always properly realised by their respective Governments.

The relationship which has so long existed between Kew and the West Indies has been a very happy one, and now that I have had the opportunity of seeing something of the excellent work which is being done by our men, I can only conclude by expressing the hope that the West Indies may continue to avail themselves of the help which Kew is always ready to render.

A. W. HILL.

XIX.—FUNGI EXOTICI : XIII.

Of the eight new Fungi here described, two are considered to be injurious parasites. *Pheangella Heveae* is found on the bark of young Hevea rubber trees in S. Nigeria ; and *Colletotrichum necator*, received from Mr. Ridley from Singapore, is said to cause the fruit of pepper to become blackened and shrivelled.

Of the other species three have been received from Mr. F. Manson Bailey, Brisbane, and one each from India, Trinidad, and Java.

Basidiomycetes.

Lepiota aurea, *Massee*.

Pileus carnosulus, e convexo-campanulato explanato-depressus, interdum subumbonatus, aureus, dein decoloratus et in squamulas fuscidulas eleganter excoriatus, siccus, circa 2 cm. latus. *Lamellae* liberae, postice angustatae, ex albo luteolae. *Stipes* subaequalis, fistulosus, fibrillosus, pileo concolor, 4–5 cm. longus, 2 mm. crassus, annulus tomentosus, mox evanidus. *Sporae* ellipsoideae, hyalinae, 7 × 4μ.

Queensland. On manured ground. *C. T. White*. The specimen was sent by Mr. F. M. Bailey, accompanied by a coloured figure.

Galera delicatula, *Massee*.

Pileus tenerrimus, e convexo expansus usque planus, margine subrepando, cinnamomeus, primo fibrilloso-villosus, postea squamulis concoloribus adpressis vestitus, siccus, 1–2 cm. latus. *Lamellae* confertae, angustae, adnexae, e pallido cinnamomeo-fulventes, acie albido-pruinosa. *Stipes* fistulosus, cylindraceus, glaber, pileo concolor, 4–5 cm. longus, 2 mm. crassus. *Sporae* ellipsoideae, utrinque obtusae, cinnamomae, 15–16 × 7μ.

India. District of Dacca : Experimental Farm, in grass, *Burkill*, 34,928.

Allied to *Galera vinolenta*, Berk., which differs in the vinous colour of the pileus, and the much smaller spores.

Ascomycetes.

Eutypa gigaspora, *Massee.*

Stroma latissime effusum, innatum, dein superficiale, scabrum, extus intusque atrum. *Perithecia* majuscula, ostiolo papillato. *Asci* cylindracei, brevissime pedicellati, 200 × 12μ, octospori. *Sporae* oblique monostichae, elongato-ellipsoideae, rectae vel plus minusve curvulae, hyalinae, 30–32 × 8–9μ.

Trinidad. On dead wood, *H. Caracciolo.*

Allied to *Eutypa erumpens*, Mass., but distinguished by the much larger spores.

Hypospila Eucalypti, *Wakefield.*

Maculae amphigenae, brunneo-rufae, circa 4 mm. diametro. *Perithecia* nigra, irregulariter concentrice disposita, parenchymati folii immersa, epidermide bullatim inflata obtecta. *Asci* ellipsoidei, apice subacuto, incrassato, brevissime pedicellati, 80–85 × 25–28μ, octospori. *Sporae* tristichae, cylindraceae, utrinque obtusae, leniter curvulae, guttulatae, dein 1-septatae, 45–50 × 5μ.

Adest status conidiiferus; *receptacula* ut perithecia, *conidia* hyalina, elliptica, 5–7 × 1–1·5μ.

Queensland. Darra: on leaves of *Eucalyptus*, *C. T. White.* Received through Mr. F. M. Bailey.

Pheangella Heveae, *Massee.*

Ascomata erumpente-superficialia, basi crassa substipitata, caespitosa vel seriatim disposita, ex urceolata patellato, coriacea, sordide ochracea, 1 mm. diametro. *Asci* elongato-clavati, octospori, 65 × 9–10μ, paraphysibus obvallati. *Sporae* distichae, oblongo-ellipticae, utrinque rotundatae, uniseptatae, ad septa non constrictae, hyalinae, 11–12 × 6μ.

S. Nigeria. On bark of *Hevea*, *Johnson.*

Considered an injurious parasite on the bark of young trees.

Deuteromycetes.

Gloeosporium Tristaniae, *Massee.*

Acervuli innato-erumpentes, convexuli, sparsi vel aggregati, pallidi, 0·5–1·5 mm. lati, epidermide lacerata cincti. *Conidia* ellipsoidea, hyalina subinde 2-guttulata, 6–9 × 2–3μ. *Basidia* filiformia, hyalina, 6–8μ longa.

Queensland. Virginia Creek: on leaves of *Tristania laurina*, R. Br., *C. T. White.* Received through Mr. F. M Bailey.

Distinguished from all known species by the small size and the form of the conidia.

Colletotrichum necator, *Massee.*

Maculae minutae, pallescentes. *Acervuli* laxe gregarii, orbiculares, mox erumpentes, 200–250μ diametro. *Conidia* hyalina, subcylindracea, utrinque obtusa, 20–23 × 5–7μ, sterigmatibus cylindraceis vel sursum attenuatis hyalinis 40–50 × 5μ suffulta. *Setulae* paucae, rigidae, cylindraceo-attenuatae, septatae, 100–130 × 4–6μ, fuligineae.

Singapore. On fruit of pepper, *Ridley.*

Said to cause the fruit to become blackened and shrivelled.

Distinguished by its habit, and by the few hairs present intermixed with the spores.

Excipula nigro-cincta, *Massee*.

Perithecia innato - erumpentia, cupulata, subcoriacea, glabra, pallida, nigro-marginata, circa 300μ diametro. *Conidia* continua, hyalina, ellipsoidea, 30–35 × 10–12μ.

Java. On leaves of *Hoya*, *F. W. Moore*.

Distinguished from all known species by the pallid disk, surrounded by a black margin.

XX.—DIAGNOSES AFRICANAE : XLVII.

1331. **Argomuellera sessilifolia**, *Prain* [Euphorbiaceae-Crotonae]; species ab *A. macrophylla*, Pax, foliis glabris sessilibus basi rotundatis facillime distinguenda.

Frutex vel *arbor* parva, ramulis fusco-pubescentibus. *Folia* sessilia, chartacea, oblanceolato-oblonga, obtuse acuminata apice mucronulata, a quadrante summo versus basin angustam rotundatam attenuata, margine minute remote denticulata, utrinque glabra, 35 cm. longa, 7·5–9 cm. lata; stipulae fusco-pubescentes, lanceolatae, 1·2–1·8 cm. longae. *Racemi* ex axillis superioribus plures, 15–22 cm. longi, rhachide gracili pubescente; bracteae patentes, ovatae, acutae; flores glomerulati, glomerulis flores masculos plures femineum solitarium centralem includentibus. ♂ *Sepala* 4 vel 3, erecta, ovato-lanceolata, 3 mm. longa. *Stamina* plurima; filamenta glandulis interstaminalibus apice hirsutis consociata. ♀ *Sepala* 6, rarius 5, distincte 2-seriata, interiora angustiora, ovata, acuta. *Ovarium* 3-loculare, pubescens; styli recurvi, superne intus longitrorsum stigmatici, basi connati. *Capsula* subglobosa, plus minusve 3-sulca, in coccos 2-valves dissiliens, extra pubescens, 8 mm. lata. *Semina* globosa, cinerea, maculis brunneis notata, 4 mm. lata.

Tropical Africa. Lower Guinea: Gaboon; Ogowé, *Thollon*, 741.

1332. **Crotonogyne strigosa**, *Prain* [Euphorbiaceae-Crotoneae]; species *C. Poggei*, Pax, et *C. impeditae*, Prain, quam maxime affinis; ab illa corolla maris margine subintegra nec distincte 5-loba staminibusque paucioribus, ab hac glandulis extrastaminalibus discretis, corollaeque tubo intus glabro, ab ambabus indumento strigoso magnopere discrepat.

Frutex, ubique plus minusve pilis rigidiusculis patentibus strigosus. *Folia* alterna, sparsa, breve petiolata, membranacea, obovata vel oblanceolato-oblonga, apice longiuscule acuminata a triente summo gradatim deorsum angustata, ipso basi anguste rotundata vel truncata, eglandulosa, margine integra, parce strigosa, 17–30 cm. longa, 6–10 cm. lata, saturate viridia, utrinque secus nervos parce strigosa; petiolus 6–10 mm. longus, dense strigosus; stipulae anguste lanceolato-oblongae, 2 cm. longae, extra dense strigosae. *Racemi* 15–25 cm. longi, simplices; rhachides dense strigosae; flores masculi glomerati, glomeruli pauciflori; feminei solitarii, pauci, versus apicem rhachidis; pedicelli masculi brevissimi, feminei demum 6–8 mm. longi, dense strigosi; bracteae extra dense strigosae. *Calyx* maris globosus, extra dense breviter pubescens, in alabastro clausus, demum valvatim 3-lobus, 2 mm. latus. *Corolla* alba, gamopetala, calyce longior, tubo campanulato, intus glabro,

limbo integro vel minopere undulato. *Stamina* circiter 10, exteriore 4, glandulis extrastaminalibus globosis glabris contiguis sed discretis circumcincta. *Calyx* feminei anguste ovoideus, extra dense strigosus, 5 mm. longus ; lobi 5, anguste lanceolati, acuti, eglandulosi. *Petala* 5, alba, orbicularia, imbricata, calycis lobis breviora. *Discus* urceolatus. *Ovarium* dense strigosum ; styli 3, singuli 2-partiti. *Capsula* dense strigosa, 8 mm. longa, in coccos 2-valves dissiliens.

Tropical Africa. Lower Guinea : Southern Nigeria ; Oban district, *Talbot*, 658 and 659 (Herb. Brit. Mus.).

1333. **Micrococca scariosa**, *Prain* [Euphorbiaceae-Crotoneae] ; species nulli inter congeneres arcte affinis, bracteis rigidis bracteolisque maris plurimis scariosis pedicellos articulatos involventibus insignis, ideoque certissime saltem pro typo sectionis adhuc haud cognitae habenda.

Frutex dioicus, 1–2-metralis, valde ramosus, ramis ramulisque glabris, cortice brunneo lenticellato. *Folia* alterna, breve petiolata, chartacea, ovato-oblonga, acuta vel breve acuminata, margine crenato-dentata vel subintegra, basi rotundata ibique minute 2-glandulosa, 7–13 cm. longa, 3–6·5 cm. lata ; pallide viridia, utrinque glabra, penninervia, nervis utrinsecus 5–6 arcuatim ascendentibus prope marginem anastomosantibus subtus distincte elevatis ; petiolus 2–8 mm. longus, glaber, subcylindricus sed supra anguste canaliculatus ; stipulae subulatae, 5 mm. longae, glabrae, caducae. *Spicae* rigidiusculae ; rhachides 5–15 cm. longae, distincte interruptae, subtrigonae, virides, glabrae, laterales, oppositifoliae vel infra folia secus ramos ramulosque orientes, maris fasciculatae, feminei singulae ; bracteae lanceolatae, rigidae, inter se 2–6 mm. distantes, 2–3 mm. longae ; bracteolae maris scariosae, obtusae, plurimae, 1 mm. longae, feminei rigidae, lineares, binae, 1·5 mm. longae ; pedicelli articulati, maris 2 mm. longi, dimidio infra articulationem complanato angulis acutis sub lente ciliolatis, dimidio supra articulationem terete glabro, feminei demum 4 mm. longi. *Flores* maris glomerati singillatim tamen evoluti citoque decidui partem pedicelli inferiorem tantum relinquentes ; feminei solitarii. ♂ *Calyx* ovoideo-globosus, albus, vix 1 mm. latus, valvatim 2–3-partitus. *Stamina* 21–24, receptaculo parum elevato inserta, glandulis juxta-staminalibus inter se liberis glabris vel apice parce pilosis totum receptaculum tegentibus immixta ; filamenta libera, glabra ; antherae 2-locellatae ; locelli basifixi primum erecti, deinde divaricati, praeter basin inter se liberi, longitudinaliter dehiscentes. *Ovarii rudimentum* 0. ♀ *Sepala* 5, ovata, acuta, margine sub lente ciliolata, ceterum glabra, imbricata. *Discus* hypogynus e glandulis 6 (an semper 6 ?) oblongis contiguis sed inter se liberis compositus. *Ovarium* 3-loculare, glabrum ; style 3, a basi liberi, subreflexi, ut videtur apice tantum fimbriati : ovula in quoque loculo solitaria. *Capsula* (singula tantum visa) 3-cocca, crustacea, primum septicide dissiliens.

Tropical Africa. German East Africa : Monyouni, *Sacleux*, 1630 (Aug. 1891) ; Amboni forest, near Tanga, *Sacleux*, 1630 (1897).

We have only been able to examine the analysis of a single female flower, and have only seen a single fruit ; the latter, however, already shows the commencement of septicidal dehiscence without any trace of the loculicidal opening which probably ultimately

takes place. The true character of the stigma is not perfectly clear. Except for the peculiar glomeruli of scarious bracts in the male inflorescence, the characters of this plant are, however, clearly those of a *Micrococca*, to which genus it may for the moment be most conveniently referred. But the peculiar nature of the male glomeruli renders it necessary to recognise it as the type of a distinct section within that genus.

1334. **Pycnocoma Thollonii**, *Prain* [Euphorbiaceae-Crotoneae]; species quoad folia *P. macrophyllam*, Benth., simulans sed ab ea bracteis planis nec concavis, reflexis nec adscendentibus, spathulato-trapeziformibus manifeste differt.

Frutex ramulis gacilioribus duriusculis. *Folia* chartacea, glaberrima, viridia, obovato-oblanceolata, acuta vel acuminata, a triente summo versus basin anguste rotundatam attenuata, margine indistincte undulata, 25–38 cm. long, 10 cm. lata, sessilia. *Flores* racemosi, racemi ad ramulorum apices axillares, rhachi 6–8 cm. longa minute puberula; bracteae 6 mm. longae, spathulato-trapeziformes, planae, reflexae, apice minutissime 3-lobulatae, margine minute ciliatae ceterum extra intusque glabrae; pedicelli graciles, puberuli, 1·25 cm. longi, sub quaque bractea 1–3. *Sepala* maris 3, ovato-triangularia, acuta, extra parce puberula vel glabra. *Stamina* plurima; filamenta gracilia, 1·25 cm. longa. *Sepala* feminei 5, ovato-lanceolata, acuta, extra glabrescentia vel glabra. *Ovarium* 3-loculare, pubescens; loculi singuli, dorso 2-cornuti; styli 3, parce hirsuti, basi breviter connati.

Tropical Africa. Lower Guinea; French Congo; Ogowé, *Thollon*, 842.

1335. **Tragia (Tagira) polygonoides**, *Prain* [Euphorbiaceae-Crotoneae]; species *T. spathulatae*, Benth., quam maxime affinis, foliis fere glabris, calycis feminei segmentis angustioribus satis differt.

Herba; caules elongati, graciles, volubiles, glabri. *Folia* distincte vel longe petiolata, membranacea, ovato-oblonga vel ovato-oblanceolata, apice obtuse acuminata, mucronulata, basi distincte cordata, margine subintegra, nervis supra parce setosis subtus parcissime puberulis ceterum glabra, 6·5–10 cm. longa, 2–3 cm. lata; petioli parce puberuli, 0·7–4 cm. longi; stipulae ovatae, acutae, erectae, 4–5 mm. longae, minute puberulae vel glabrae. *Racemi* laterales, graciles, densi, 6–8 mm. longi, pedunculo nudo gracile pubescente 0·8–1·2 cm. longo suffulti, flores masculos plures versus apicem femineosque 1–2 basales gerentes; pedicelli sub quaque bractea singuli, bracteisque breviores; bracteae maris ovatae, acutae, 2–4 mm. longae, glabrae; bracteae feminei orbiculares, acute 3-lobae, bracteolae feminei ovatae, acutae. ♂ *Sepala* 3, ovata, apice pilis perpaucis induta. *Stamina* 3, filamenta brevissima. ♀ *Sepala* 6, ambitu anguste oblonga, subacuta, membranacea, integerrima, 8 mm. longa, in stipitem latum marginibus parcius hirsutum angustata. *Ovarium* parcius hispidum; styli 3, minute pubescentes, basi in columnam connati quadrante summo liberi. *Capsula* ignota.

Tropical Africa. Upper Guinea: Ivory Coast; Bouroukrou, *Chevalier*, 16,860.

Very nearly allied to *T. spathulata*, Benth., with which it agrees in having the female calyx-lobes quite entire but from which it differs in having them much smaller and narrower and in having nearly glabrous leaves.

1336. **Tragia (Tagira) anomala**, *Prain* [Euphorbiaceae-Crotoneae] ; species *T. ambiguae*, S. Moore, proxima, a qua differt foliis praeter nervos pilis setosis obsitos glabris stylisque more *Sphaerostylis Tulasneanae*, Baill., in massam globosam 3-sulcam ovarium primum aequantem vel paulo superantem connatis.

Herba ; caules elongati, graciles, volubiles, pilis urentibus armati. *Folia* distincte petiolata, membranacea, oblonga, acuta, basi distincte cordata sinu angustato, margine crebre crenata vel dentata, supra secus nervos parce setosa, subtus secus nervos densius pilis urentibus armata, ceterum glabra, 8–15 cm. longa, 3–6 cm. lata ; petioli glabri vel glabrescentes, 2–4·5 cm. longi ; stipulae lineari-lanceolatae, reflexae, 5–6 mm. longae, extra parce pubescentes. *Racemi* laterales, graciles, laxiusculi, 3–4 cm. longi, pedunculo nudo gracile minute puberulo 1·2–2·5 cm. longo suffulti, flores masculos plures versus apicem femineosque 1–2 basales gerentes ; pedicelli subquaque bractea singuli, maris 5–6 mm. longi, minute puberuli, bracteas excedentes ; bracteae maris oblongo-subspathulatae, obtusae vel subacutae, 2–4 mm. longae, membranaceae, extra puberulae ; bracteae feminei oblanceolatae-oblongae, acutae, margine utrinsecus 2–3-dentatae nec lobatae ; bracteolae feminei bracteis similes nisi minores. ♂ *Sepala* 3, late ovata, extra parce puberula. *Stamina* 3 ; filamenta brevia ; antherae introrsae. ♀ *Sepala* 6, ambitu ovato-lanceolata, primum membranacea, demum accrescentia vix tamen coriacea, 1 cm. longa, pinnatim utrinsecus 7–9-lobulata, lobuli laterales rhachideque dense lanati pilis longissimis ; laminula terminalis anguste ovata, fere glabra, lobulis lateralibus paullo major. *Ovarium* dense adpresse setosum ; styli in massam globoso-pyriformem cavam 3-sulcam primum ovarium aequantem connati, apice summo stigmatico brevissime liberi recurvi demum inter cavitatem columnae stylaris plus minusve retracti. *Capsula* 3-cocca, parcius pilosa, 8 mm. lata ; cocci subglobosi. *Semina* globosa, brunnea maculis albido-cinereis notata.

Tropical Africa. German East Africa : Ukinga ; Mt. Kirunde, 2000 m., *Goetze*, 907. Nyasaland : Masuku Plateau, 2000–2150 m., *Whyte*, 269.

This *Tragia* is most nearly related to *T. ambigua*, S. Moore in *Journ. Linn. Soc. Bot.*, xl., 202, recently described from specimens collected by Swynnerton in Gazaland. Mr. Moore's species is, however, an unusually widely spread plant in East Africa which was described by Mueller in 1864 (*Flora* xlvii. 435), as *T. mitis* var. *oblongifolia*, and is very doubtfully distinct from *T. natalensis*, Sond. in Linnaea xxiii (1850) 107. It resembles a group of species, including *T. tenuifolia*, Benth., *T. laminularis*, Muell.-Arg. and *T. Zenkeri*, Pax, characterised by the presence, on the female calyx segments, of a terminal herbaceous laminula which does not harden as the lobes enlarge during the ripening of the fruit. The styles in the species of this group, which is mainly West African, are united in a slender column for one half their length or less ; those of

T. ambigua, however, are connate throughout in a narrow funnel-shaped tube with only the stigmas free. The known Tropical African localities of *T. ambigua* are as follows:—British East Africa: Kibwezi, *Kaessner*, 706. German East Africa: Rosallo Thal, *Holst*, 3861; Kerematonto, 1700 ft., *Engler*, 3347. Portuguese East Africa: Moramballa, 3500 ft., *Kirk*; Gazaland; Chirinda Forest, 3700–4000 ft., *Swynnerton*, 446, 795. The known South African localities of *T. ambigua*, are:—Cape of Good Hope, *Drège* (T. involucrata, *Drège non Jacq.*) Port St. John, 50 ft., *Galpin*, 3462; Natal; Manda, *Gerrard*, 1164; *Wood*, 741. From *T. ambigua*, S. Moore, the species described as *T. anomala* is readily distinguished by its pubescence and differs further from its ally in having the style-column swollen into a pyriform or sub-globose mass quite as large as the ovary when in flower. In this character *T. anomala* therefore agrees with the Madagascar plant described by Baillon (Étud. Euphorb., 466, t. 21) as *Sphaerostylis Tulasneana*. This genus *Sphaerostylis*, which has been doubtfully maintained by Mueller (*DC. Prodr.*, xv., 2, 768) and by Bentham and Hooker (*Gen. Plant.*, iii., 327), as described by Mueller differs from *Tragia* in having a central staminal column, 2-partite stigmas and a globose inflated style-column. As described by Baillon the stigmas are said to be channelled but not said to be 2-partite. The description given of the androecium both by Baillon and by Mueller is such as might apply to that of the androecium of most of the Tragias of the group which *T. anomala* resembles, which have extremely short or quite obsolete filaments; Baillon's description and figure of the style-column and stigmas of *Sphaerostylis Tulasneana* accord very closely with the conditions met with in *T. anomala*. It appears probable therefore that *Sphaerostylis Tulasneana* may be only a rather distinct species of *Tragia*.

1337. **Cadalvena Dalzielii**, *C. H. Wright* [Scitamineae-Zingibereae]; a *C. spectabili*, Fenzl, corollae tubo longiore tenui floribusque minoribus differt.

Rhizoma breve, crassum, carnosum. *Folia* 4, rosulatim disposita, explanata, suborbicularia, ad 10 cm. diametro, utrinque glabra, marginibus membranaceis rubris albo-ciliatis; nervi laterales utrinque 9–14, tenues; venae transversales numerosae, approximatae. *Flores* brevissime spicati; bracteae lanceolatae, 3 cm. longae, 3 mm. latae, pubescentes. *Calyx* spathaceus, breviter 3-dentatus, 3 cm. longus. *Corolla* lutea; tubus 4 cm. longus, tenuis; lobi oblongi, acuminati, 3 cm. longi, 1 cm. lati. *Labellum* luteum, 4 cm. latum, undulatum, infra cuneatum. *Antherae* 5 mm. longae; connectivum oblongum, obtusum, 2 cm. longum, 4 mm. latum. *Ovarium* 6-costatum, pubescens, 3-loculare; ovula plura.

Tropical Africa. Northern Nigeria: Yola Province; Kilba Country, *Dalziel*, 229. Sokoto and Kontagora Provinces, *Dalziel*, 560.

Hausa name "*takalmin zomo*" (=hare's slipper).

1338. **Testudinaria paniculata**, *Dümmer* [Dioscoreaceae]; affinis *T. sylvaticae*, Kunth, sed inflorescentia majore paniculato-ramosa, perianthiis majoribus rotatis tubo breviore et foliis coriaceis 10–13-nerviis differt.

Planta mascula, robusta, subsempervirens. *Rhizoma* epigaeum, 7·5 cm. altum, irregulariter-oblongum, lignosum, supra complanatum, tesselato-lobatum, fuscum. *Caulis* superne volubilis, ad basin 1·2 cm. diametro, teres vel subcompressiusculus, rigidus, laevis, glaber, viridescens, obscure lenticellatus. *Folia* 2·5–7 cm. longa, 4–11·5 cm. lata, patentia, late reniformia vel breviter deltoideo-subcordata, obsolete triloba, mucronata, 10–13-nervia (raro 9-nervia), utrinque reticulata et nitentia, coriacea, atroviridia, subtus pallidiora, pellucido-maculata, glabra, margine integra, paullo subrecurvata ; petioli 1·8–3·7 cm. longi, ascendentes, utrinque complanati, supra paullo sulcati. *Paniculae* axillares, multiflorae, sparse vel copiose ramosae, ramis infimis saepius 6 cm. longis, rachi 5–12·7 cm. longa angulata sparse puberula. *Flores* pedicellati, odorati, subviridescentes vel pallideflavidi, pedicellis 2–4 mm. longis saepe florem abortivum gerentibus uni-vel bibracteolatis ; bracteolae 0·7 mm. longae, ovatae, apice acutae, carinatae, membranaceae. *Perianthium* 0·8–1 cm. diametro, rotatum, tubo brevissimo, segmentis enerviis patulis vel subrecurvatis subaequalibus obtusis vel apiculatis. *Stamina* parva, quam perianthii segmenta breviora eorumque basibus affixa. *Ovarii rudimentum* vix conicum, obscure trituberculatum. *Planta feminea* ignota.

South Africa.

The plant upon which the preceding description is based has been cultivated in the Succulent House at Kew under the name of *T. sylvatica*, Kunth, for over 30 years and it was a remark passed by Dr. R. Marloth, whilst on a visit to Kew, which suggested a re-examination of the plant, when its correct status was ascertained. The most salient points of distinction between this and the species with which it has hitherto been confounded lie in the curiously flattened, not dome-shaped, woody rhizome, the coriaceous, subevergreen 10–13-nerved leaves and the larger, short-tubed, rotate flowers, which are moreover disposed in large, axillary panicles.

Although the type specimen of *T. paniculata* came originally from South Africa, it is unfortunate that no record of its introduction to Kew can be discovered nor can anything be said as to its geographical distribution.

1339. **Seychellaria madagascariensis**, *C. H. Wright* [Triuridaceae]; a *S. Thomassetii*, Hemsl., perianthio florum ♂ 3- (raro 4-) lobato differt.

Rhizoma repens, flexuosum, tenue. *Caulis* erectus, pallidus, 15 cm. altus (inflorescentia inclusa), aphyllus, glaber, squamis paucis distantibus deltoideis acuminatis 3 mm. longis instructus. *Racemus* simplex vel ramosus, circiter 4 cm. longus ; bracteae 0·5 mm. longae, membranaceae, acutae ; pedicelli 1·5 mm. longi, filiformes. *Flores* ♂ in parte superiore racemi 2–4-natim dispositi. *Perianthium* 2 mm. diametro ; lobi 3, raro quarto parvo adjecto, late ovati, glaberrimi. *Stamina* 3 ; filamenta brevia ; antherae didymae, transverse dehiscentes. *Staminodia* filiformia, staminibus longiora. *Flores* ♀ infra ♂ singulatim dispositi. *Perianthium* 4–5-lobatum, 1·5 mm. diametro ; lobi late ovati, glaberrimi, recurvati. *Carpella*

plura, compresso-ovoidea, 0·74 mm. longa; stylus lateralis, filiformis, ovario triplo longior.

North-East Madagascar. *Perrier de la Bâthie.*

Described from a specimen communicated by Prof. H. Jumelle.

1340. **Drake-Brockmania**, *Stapf* [Gramineae-Festuceae]; *Entoplocamiae*, Stapf, affinis, et quoad habitum spicularum ei simillima, sed anthoeciis omnibus florigeris, rhachilla fragillima, valvis 5-nerviis, pericarpio haud soluto distincta.

Spiculae lateraliter admodum compressae, mucronatae, sessiles vel subsessiles, in paniculam saepissime capitatim contractam dispositae; rhachilla anfractuosa inter anthoecia fragillima, articulis distinctis. *Anthoecia* circiter 7–8, summo admodum reducto excepto omnia ♂. *Glumae* acuminatae, infra medium late membranaceo-marginatae, caeterum arcte viridi-nervosae, inferior nervis 3–5 (rarius 1), superior nervis 9. *Valvae* mucronatae, latae, albido-membranaceae, eximie utrinque nervis 2 viridibus notatae, in carina a basi ad medium dense ciliatae; callus 0. *Paleae* valvis breviores, curvatae, 2-dentatae, carinatae, carinis alatis ala medio in dentem producta, glabrae. *Lodiculae* 2, minutae, cuneatae. *Stamina* 3. *Ovarium* glabrum; styli ima basi connati, capillares, longiusculae; stigmata tenuia, plumosa, sub apice anthoecii breviter exserta. *Caryopsis* valva paleaque inclusa et cum iis decidua, a latere subcompressa; pericarpium tenue, adnatum. *Embryo* ad medium caryopsis attingens, prominens, scutello ima basi a coleorrhiza libera, epiblasto distincto obtuso.—*Gramen* annuum, a basi ramosum, ramis brevissimis vel elongatis et tunc geniculato-adscendentibus et iterum ramosis, foliis mollibus.

D. somalensis, *Stapf*. *Species* unica.

Gramen ad 12 cm. altum. *Culmi* teretes, glabri, laeves, internodiis exsertis. *Foliorum* vaginae inferiores laxae, basin versus latae, omnes saltem inferne hirsutae pilis tenuibus tuberculo insidentibus; ligulae membranaceae, breves, truncatae, denticulatae; laminae molliter herbaceae, lineares vel lanceolatae, longe sursum attenuatae, acutae, 1–6 cm. longae, 1–3 mm. latae, virides, multinervosae, inferne hirsutae. *Paniculae* capituliformes, 1–1·5 vel fere 2 cm. longae lataeque, foliis saepe superatae; rhachis tenuis, tenax, glabra; rami pauci, breves, magis minusve compressae. Spiculae ambitu late ovatae, 6–7 mm. longae lataeque, albidae, viridi-variegatae. *Glumae* subaequilongae, lanceolatae, acuminatae, 6–7 mm. longae, praeter margines inferiores virides, persistentes. *Valvae* a latere visae late oblique ovatae, 3–4 mm. longae, ad carinam et prope margines infimas molliter ciliatae, nervis lateralibus a carina remotis. *Paleae* glabrae. *Lodiculae* 0·3–0·4 mm. longae. *Antherae* ellipticae, 0·65–0·75 mm. longae, stigmatibus adhaerentes et cum iis exsertae; filamenta capillaria. *Styli* ad 1 mm. (vel ultra) longae; stigmata ad 1·5 mm. longa, angusta. *Caryopsis* olivaceo-grisea vel humefacta brunnea, paulo 1 mm. excedens.

British Somaliland. Bulhar, *Drake-Brockman*, 616, 617, 646, 647.

Vatsoni, *W. W. Smith* [Malvaceae-Hibisceae] c
llati, Roxb., a quo spicis floriferis multibracteat
t petalis angustioribus differt.
. altus, erectus vix ramosus ; caulis infra lignos
nda ab incolis adhibitus, supra fistulosus, pallidu
pidis ornatus, tandem in spicam aliquando 30 c
. diametro densissime floribus confertis et bracte
desinens. *Folia* orbicularia, cordata, sinuata v
oice at lobis acuta, basi profunde (ad 5 cm.) fiss
lus minusve hispida praecipue ad nervos in junio
nervos et reticulationem productos laciniatis, 2
lata ; costae 5, prominentes, media et intermedi
nervis utrinque 3–4 munita exteriores deflex
irca 5 ; nervuli transversi multi prominentes,
us crassus. *Spica* terminalis, multiflora ; flor
s linearibus sericeis etiam hispido-glandulos
ffulti ; involucrum tubulosum, sericeum, 10–1
. longo, lobis longe acuminatis inaequalibus 2 c
bspathaceus, coriaceus, sericeus, striatus, in lob
sus, 3–4 cm. longus, basi intus pilis multis alb
flava, basi tubulosa, tubo stamineo adnata ; lo
apice rotundati, acutati vel emarginati, 3–3·5 c
i. *Stamina* in columnam 3–4 cm. longam connat
a ; antherae reniformes, crassae, tandem la
nis granulae magnae, globosae, spinosae. *Ovariu*
5, breves, connati, supra ad 2–3 cm. soluti, villo
tis complanatis. *Capsula* ovata, dense serice
3 cm. alta, 1·5 cm. diametro. *Semina* in quoq
reniformia, villosa, 5 mm. longa ; testa coriace
gi, 3·5 mm. longi ; radicula cylindrica, 2·5 m

IAN STATES. At Taunggyi, about 1000
n, 2061 ; near Pinlaung, 1200–1500 m. on roc
Forest, *W. A. Robertson*, 94.

ya multiflora, *Gamble* [Sterculiaceae] ; a *P. bu*
iis longioribus, florum fasciculis axillaribus plu
noribus praecipue differt.
arbor parva, ad 3 m. alta, ramulis teretibus fus
a infra nodos latiuscula munitis. *Folia* longissi
oranacea, serrata, apice longe acuminata, ba
cm. longa, 3–4·5 cm. lata ; utrinque in parenchyma

3–5 mm. longi, bracteolis 3 lanceolatis seu linearibus. *Calycis* segmenta oblongo-lanceolata, 4–5 mm. longa, reticulata et receptaculis subcutaneis mucilagine repletis munita. *Petala* late et inaequaliter obovata, truncata, 5 mm. longa, apice 4 mm. lata. *Stamina* perfecta 15, cum staminodiis 5 in annulum coalita ; filamenta gracilia, inaequalia, aliquando per paria unita ; antherae ovatae, connectivo incrassato junctae ; staminodia linearia, mucilaginea, 4–5 mm. longa. *Ovarium* 5-loculare, dense stellatim albo-tomentosum ; stylus subclavatus, 4–5 mm. longus. *Capsulae* loculi 5, globosi, dense stellatim albo-tomentosi, introrsum loculicide dehiscentes, 2–3 mm. diametro, pericarpio tenuiter crustaceo. *Semina* in quoque loculo 2 perfecta, ellipsoidea ; testa coriacea ; albumen copiosum ; cotyledones plicatae.

Southern Shan States. At Loi Ai : near Sukat Kyaukdwin, in scrub forest and old clearings, 760 m., *W. A. Robertson*, 65, Dec. 1909.

643. **Elaeocarpus Robertsoni**, *Gamble* [Tiliaceae] ; *E. petiolato*, Wall., affinis, foliis minus coriaceis, ovario villoso triloculari (nec glabro biloculari) et antheris brevissime et obtuse apiculatis (nec aristatis) praecipue differt.

Arbor ad 12 m. alta, ramulis griseo-brunneis, ultimis glabris. *Folia* chartacea, ovata, apice obtuse acuminata, basi rotundata ; margine inconspicue crenata vel subintegra ; utrinque siccitate glabra, olivacea, supra vix lucida ; 10–12 cm. longa, 4–6 cm. lata ; nervi utrinque 8–10, pallidi, ramosi, ramis in glandulas crenaturarum desinentes ; reticulatio conspicua ; petiolus 2·5–4 cm. longus, glaber, supra sulcatus. *Racemi* axillares, glabri, pauciflori, floribus ad 15 sparsis saepissime recurvis ; rhachis angulatus, sulcatus ; pedicelli circa 1 cm. longi. *Calycis* lobi 5, lanceolati, 7–8 mm. longi, acuminati, margine incurvo excepto glabri, costa intus prominente. *Petala* 5, oblonga, 8–9 mm. longa, apice fimbriata, dentibus circa 9 1·5–2 mm. longis, basi ad dimidiam partem incurva, extus sericeo-villosa, intus etiam pilis decurvis villosa et incrassata, ad basim ob glandulas discoideas excavata. *Discus* carnosulus, lobis 10 subglobosis, glabris. *Stamina* circa 20–24, linearia, puberula, 5 mm. longa, antheris apice in mucronem brevem obtusum desinentibus, filamentis antheris dimidio brevioribus. *Ovarium* ovoideum, triloculare dense albo-villosum ; stylus ultra stamina paullo elongatus, parce villosus. *Drupa* ignota.

Southern Shan States. At Kalaw, near water, 1310 m., *W. A. Robertson*, 149, April 1910.

6894 644. **Lespedeza sessilifolia**, *Gamble* [Leguminosae-Hedysareae] ; species foliis sessilibus insignis, aliis notis ad *L. eriocarpam*, DC. accedit.

Arbuscula ramulis virgatis angulatis albo-sericeis ultimis quadrangulis. *Folia* chartacea, trifoliata, sessilia vel petiolo vix 3 mm. longo ; foliola elliptica vel elliptico-obovata, apice mucronata, apice et basi rotundata, medium ad 5 cm. longum, 2·5 cm. latum petiolulo 7 mm. longo, lateralia minora petiolulis vix 2 mm. longis ; supra glabra pallida, infra adpresse sericeo-villosa ; nervis utrinque 8–10 prope marginem arcuate junctis et reticulatione prominenter areolata : stipulae subulatae, petiolo longiores. *Racemi* axillares, graciles,

ad 8–10 cm. longi ; rhachis albo-sericea ; bracteae subulatae, 2 mm. longae ; pedicelli filiformes, 5 mm. longi. *Calyx* campanulatus, extus sericeus, 3–4 mm. longus, fere ad basin fissus, lobis 2 superioribus ad dimidiam partem junctis. *Corolla* purpurea, ad 1 cm. longa ; vexillum obovatum ; alae oblongo-obovatae, stipitatae, auriculo prope basin rotundato ; carina in angulum rectum curvata, acuminata. *Stamina* petalis longiora, antheris minutis. *Ovarium* dense sericeum, stylo longo filiformi curvato. *Legumen* obovatum, apiculatum, dense sericeo-villosum, 7 mm. longum, 4 mm. latum.

Southern Shan States. On bare hills at Paktu Mong, 1220 m., *W. A. Robertson*, 54, Dec. 1909.

645. **Beilschmiedia Robertsoni**, *Gamble* [Lauraceae] ; quoad inflorescentia *B. Bourdilloni*, Brandis, affinis sed foliis differt. Differt etiam a *B. assamica*, Meisn., foliis et ramulis conspicue pubescentibus et ovario villoso.

Arbor elata, ad 30 m. alta, ramulis subcrassis griseis ultimis pubescentibus ; alabastra florifera conspicue perulata, foliifera parva, ovoidea, fusco-pubescentia. *Folia* submembranacea, alterna vel subopposita ; elliptico-obovata vel oblanceolata, apice acuminata, basi attenuata ; supra glabra nitida, infra puberula, praecipue ad costam et nervos ; 9–18 cm. longa, 4–7 cm. lata ; costa supra prominens glabra, infra prominens pubescens ; nervi utrinque 8–10, irregulares, ramosi ; reticulatio prominenter areolata ; petiolus circa 2 cm. longus, pubescens. *Cymae* axillares fasciculatae, conspicue perulis suborbicularibus extus griseo-pubescentibus intus glabris suffultae ; bracteolis oblongis 3 mm. longis. *Perianthii* tubus brevis ; lobi oblongi, obtusi, ad 3 mm. longi, pubescentes. *Stamina* ordinis I et II 2–3 mm. longa, filamentis latis pubescentibus ; ordinis III 2 mm. longa, glandulis 2 magnis glabris ad basim munita ; staminodia ordinis IV cordata glabra, filamentis brevibus pubescentibus, 1 mm. alta, 1·5 mm. lata. *Ovarium* ovoideo-oblongum dense villosum, stylo glabro, stigmate recurvo. *Fructus* ignotus.

Southern Shan States. In moist forest at Hlwegyi, 610 m., *W. A. Robertson*, 105, Jan. 1910.

646. **Wilkstroemia Ridleyi**, *Gamble* [Thymelaeaceae-Euthymelaceae] ; species *W. Candolleanae*, Meisn., affinis, foliis majoribus membranaceis, inflorescentia terminali differt.

Arbuscula, ramulis gracilibus fuscis teretibus ultimis puberulis. *Folia* opposita, membranacea ; lanceolata, apice obtuse acuta vel acuminata, basi acuta vel paullo rotundata ; utrinque glabra, olivacea, lucida ; 5–13 cm. longa, 2·5–4·5 cm. lata ; costa gracilis, nervi utrinque 8–10 obscuri, irregulares, obliqui, nervis paucis secundariis additis ; reticulatio obscura ; petiolus brevissimus, 2–3 mm. longus. *Flores* flavi, in fasciculis 5–6-floris terminalibus, pedunculis circa 5 mm. longis, pedicellis brevissimis pubescentibus. *Perianthii* tubus gracilis, elongatus, glaber, ad 1 cm. longus ; lobi ovati, subaequales, 4 mm. longi. *Stamina* infra tubi faucem inserta, 4 superiores a 4 inferioribus 2–3 mm. distantes, filamentis brevissimis, antheris oblongis 1·5 mm. longis. *Discus* hypogynus lobis 4 linearibus per paria junctis hyalinis 1–2 mm. longis. *Ovarium* obovoideum, apice hirsutum, stylo gracili, stigmate magno papilloso.

Drupa 6–7 mm. longa, 5 mm. diametro, pericarpio carnoso rubro. *Semen* drupae conforme; testa exterior crustacea, interior membranacea; cotyledones carnosi.

Malay Peninsula. Tringganu: at Pulo Katan, *Ridley*. Pahang: at Pekan and Kwala Brawas, *Ridley*, 1583 &c. (all in Herb. Singap.).

647. **Henslowia monticola**, *Gamble* [Santalaceae-Osyrideae]; species *H. granulatae*, Hook. f. et Thom., affinis, differt ramulis non pustulatis glabris, drupa parva globosa, pedicello gracili. Affinis etiam *H. buxifoliae*, Blume, foliis sulcatis praecipue differt.

Frutex parasiticus, ramulis laevibus angulatis nigrescentibus. *Folia* coriacea, glabra, siccitate nigrescentia, obovato-spathulata, apice obtusa et emarginata, basi in petiolum gracilem 5 mm. longum acuminata, marginibus recurvis; 2–3 cm. longa, 1·5–2·5 cm. lata; costae 3, laterales 2 pedatim divisae ut 5 essent, exteriores 4 late curvatae ad apicem, omnes in sulcis conspicuis sitae; nervi pauci, breves; nervuli transversi ut reticulatio obscuri. *Flores* in racemorum fasciculis brevissimis axillaribus vel lateralibus; racemi pauciflori, 3–5 mm. longi; bracteae 0 vel cito deciduae. *Perianthii* tubus ovarium cingens; lobi triangulares, acuti, 0·5–1 mm. longi, fructu persistentes. *Discus* concavus, 1–2 mm. latus. *Stigma* centrale 5-lobum. *Drupa* nigrescens, globosa, 3 mm. diametro, obscure sulcata; exocarpio carnoso, endocarpio rugoso angulis multis in albumen porrectis; cotyledones radiculae breviores.

Malay Peninsula. Perak: camp on Ulu Batang Padang, 1500 m., *Wray*.

648. **Henslowia Ridleyi**, *Gamble* [Santalaceae-Osyrideae]; species *H. Lobbianae*, A. DC., affinis, foliis majoribus orbiculatis, racemis longioribus et drupa magna insignis.

Frutex scandens, parasiticus (?), ramulis crassis siccitate nigrescentibus. *Folia* coriacea, late obovata vel orbiculata, apice rotundata et aliquando paullo emarginata, basi abrupte in petiolum attenuata; supra et infra glabra, supra lucida, infra ferruginea, aliquando punctulata; margine paullo recurva; 2–5·5 cm. diametro; costae primo 3, laterales 2 pedatim in 2 divisae, omnes curvatae et apicem versus arcuatim junctae; nervi nulli; nervuli transversi cum reticulatione obscuri; petiolus 1–2 cm. longus, infra subgracilis. *Flores* pro genere magni, in racemis paucifloris ad 2 cm. longis in axillis foliorum fasciculatis; bracteae parvae, deciduae. *Perianthii* tubus in ♂ brevissimus, lobis 5–6 triangularibus, 1·5 m. longis, in ♀ ovarium amplectens, lobis paullo quam in ♂ brevioribus persistentibus. *Discus* concavus, in ♂ medio solum apiculatus, in ♀ stigma lobatum circumdans. *Drupa* magna, obovoidea, circa 1·3 cm. longa, 9 mm. diametro, exocarpio tenui, endocarpio sulcato rugoso angulis multis intus in albumen porrectis.

Malay Peninsula. Selangor: at Sempang mines, *Ridley*, 15,568. Pahang: at Kluang Terbang, *Barnes*; at Gunong Tahan, 1500–1800 m., *Wray* and *Robinson*, 5484 (?)

649. **Henslowia Wrayi**, *King* MS. in Herb. Calc. [Santalaceae-Osyrideae]; species *H. Lobbianae* A.DC., affinis, drupa ellipsoideo-obovoidea 1 cm. longa (nec globosa) praecipue differt.

Frutex scandens, parasiticus, aliquando 12–18 m. attingens, ramulis teretibus gracilibus. *Folia* coriacea, glabra, siccitate

olivacea, elliptico-obovata vel-oblanceolata, interdum orbiculata, apice obtuse acuta vel rotundata, basi acuta vel acuminata, marginibus recurvis; 4–8 cm. longa, 2–5 cm. lata; costae 3 prominentes, raro ramosae; nervi pauci, breves, inconspicui, praecipue ad latera; reticulatio obscura; petiolus crassus, circa 5 mm. longus, in laminam gradatim expansus. *Flores* in fasciculis brevibus racemorum ex foliorum vel foliorum delapsorum axillis; racemi ♂ graciles, 3–4-flori, 5–7 mm. longi, bracteis parvis ovatis ad rhachim et infra flores sitis; racemi ♀ crassiores, pauciflori pedicellis vix 1 mm. longis. *Perianthii* tubus in ♂ brevissimus, lobis triangularibus 0·5–7 mm. longis apice uncinatis; in ♀ ovarium cingens, quoad lobos sicut in ♂. *Discus* concavus, 1 mm. latus, in ♂ minute apiculatus, in ♀ cum stigmate 5-lobus. *Drupa* ellipsoideo-obovoidea, 1 cm. longa, 7·5 mm. lata, non sulcata, endocarpio rugoso; albumen multilobatum.

Malay Peninsula. Perak: in hilly country, 150–300 m., *King's Collector*, 4214, 10,834; at Sungie Larut and Relan Tujor, *Wray*, 2279, 4032. Malacca, *Goodenough*, 1937; *Hervey*.

650. **Scleropyrum Ridleyi**, *Gamble* [Santalaceae-Osyrideae]; species *S. Maingayi*, Hook. f., affinis, foliis infra molliter tomentosis et drupa dimidio minore differt.

Arbor parva, ad truncum spinis rectis acutis 1–2·5 cm. longis armata; ramuli crassi, etiam spinosi, ultimi molliter ferrugineo-tomentosi sicut innovationes, inflorescentia et folia omnia vetustioribus exceptis. *Folia* submembranacea, variabilia, ovata, obovata vel oblongo-lanceolata, apice acuta vel (interdum abrupte) acuminata, basi acuta vel rotundata et saepe inaequalia; supra pallida paullo bullata, infra pallida, tomentosa; 10–25 cm. longa, 5–10 cm. lata; costa prominens, supra impressa; nervi utrinque 6–10, irregulares, infra prominentes, ad marginem curvati; nervuli transversi irregulares ut reticulatio; petiolus 0·3–1 cm. longus, supra sulcatus. *Flores* ♂ in spicis dense rufo-pubescentibus 7–8 cm. longis, rhachi crasso, perianthii tubo crasso 5 mm. longo; ♀ in spicis 15–25 cm. longis, rhachi dense pubescente, perianthii tubo cylindrico rufo-tomentoso 2–3 mm. longo; lobi ovati reflexi, 2–3 mm. longi. *Stamina* brevissima, filamentis crassis, antherarum thecis brevissimis. *Discus* 5-lobus. *Ovarium* pubescens, stylo crasso, stigmate capitato lobato, lobis reflexis. *Drupa* pyriformis, 3–4 cm. longa, 1–1·5 cm. diametro, exocarpio fere glabro, endocarpio osseo rugoso; rhachis fructifera aucta. *Semen* 1 cm. diametro, cotyledonibus tenuibus oblongis.

Malay Peninsula. Singapore: at Selitar and other places, *Ridley*, 1921, 4761, 5889; at Changi, *Hullett*, 850.

XXII.—MISCELLANEOUS NOTES.

Portrait of the late Sir J. D. Hooker.—To Mr. C. P. Hooker, Dollarward House, Cirencester, Kew is deeply indebted for the gift of a photogravure reproduction of a portrait of his father, the late Sir J. D. Hooker, as a young man. The original, a crayon drawing by the late G. Richmond, R.A., was executed in November, 1855, and is a companion picture to a similar portrait of the late Dr. T. Thomson, the companion of Sir Joseph during the later portion of

the travels described in the famous *Himalayan Journals*. The two friends returned to England in 1851 and during the next three years were conjointly engaged in the preparation of their *Flora Indica* the first and only volume of which was issued in 1855. The portraits mark the close of this period of companionship and collaboration. That of Thomson was presented to Kew by Sir Joseph many years ago and it is pleasant to reflect not only that Kew now possesses a vivid likeness of the brilliant author of the *Himalayan Journals* but that portraits of the joint authors of the *Flora Indica* hang side by side in the building in which their work was done.

Presentation of Chinese Drawings.—Under the will of the late Mrs. Mary Anne Robb (Miss Boulton of Tew Park, Oxon) a very interesting collection of twenty-three drawings in water colour of Chinese Conifers has been received at Kew for the Museums. These drawings were executed by a native Chinese artist who was engaged by the celebrated traveller Robert Fortune during his last journey at the request of Mrs. Robb as she wished to have sketches of the new trees, found by Fortune, drawn on the spot. The artist stipulated that he would only make pictures if allowed to put a human figure in each.

Mrs. Robb, who was descended from Mathew Boulton, the engineer and partner of James Watt, was possessed of great intellectual gifts and wide interests.

Among her more intimate friends were Francis Galton and the Hon. Charles Ellis. She took a keen interest in gardening and at her garden called Golden Field at Liphook she indulged in the cultivation of flowering shrubs which was one of her hobbies, the old cultivated forms of the Damask Rose being among her favourites. She often visited the Royal Botanic Gardens and corresponded frequently with Kew on horticultural matters.

The drawings are detailed in the list appended. One of them, no. 21 representing the Maidenhair tree, *Gingko biloba* (*Salisburia adiantifolia*) is already well known to botanists as it has been reproduced to form a plate for the paper on the Maidenhair tree written by Prof. A. C. Seward and published in the Annals of Botany, vol. xiv., 1900, p. 110, Pl. viii.

	Ft.
1. "Tsung le shu" (Hemp Palm) *Chamaerops* sp.	15–20
2. "Peen pih shoo," *Thuya* sp.	60
3. "Sung shoo," *Pinus sinensis*	130
4. "Lo sung shoo," *Podocarpus* sp.	80
5. "Shuy pih shoo, *Cephalotaxus Fortunei* ...	30
6. "Kin tseen sung" (Golden Coin pine), *Larix* sp.	70
7. "Water Pine,"	60
8. "Lan pan shu," *Juniperus* sp.	20–30
9. "Nyun par shu," *Juniperus* sp.	60–70
10. *Cupressus funebris*	70
11. "Kin tsien sung shu" (Golden Coin pine) *Abies Kaempferi*	100
12. "Yung ching pah shu," *Juniperus* sp.	20

	Ft.
13. "Pem pah shu," *Thuya* sp.	20–30
14. "Maou chuh," "This is the finest Bamboo in China and is prized above all others, owing to the clean branched stems it produces. Young shoots eaten by the Chinese" ...	70
15. "Mein pah shu" (Prostrate Juniper) *Juniperus* sp.	1–2
16. "Tsye sung pah shu," *Thuya* sp.	10–15
17. "Kin sung shu," *Pinus* sp. Japan, only found in gardens in China	30
18. "Pa be sung shu" (White barked pine) ...	50
19. "Lew san shoo" *Cryptomeria japonica* ...	100
20. "Peh shoo," *Juniperus sphaerica*	60
21. "Pih kwo shu" *Salisburia adiantifolia*	
22. "Tsye san shoo," *Cunninghamia sinensis* ...	50
23. "Lo tung," *Abies jezoensis*	

Agave atrovirens.—A large and extremely fine specimen of *Agave atrovirens* has been a conspicuous object in the Succulent House at Kew for many years. Early in March of the present year it showed signs of flowering, the upper leaves that were formed being much smaller and less spinous than ordinary leaves. The inflorescence or "pole" soon made its appearance and elongating rapidly, reached the roof in the course of three weeks. It then became necessary to move the plant into the open air and this entailed the removal of the greater part of the end of the building. No sooner had the plant been taken to a place on the lawn adjoining the south end of House No. 5 than the weather changed; cold winds from the north and east accompanied by frosty nights continued for over a fortnight. The growth of the plant was checked considerably, without however causing it any apparent injury. The flower spike has continued to elongate and is now some 18 feet high. The plant has exactly 60 leaves, the longest of which is 7 feet 3 inches, 9½ inches broad in the middle and 14½ inches at the base. Some of the lower leaves are 11 inches thick in the middle and 15 inches at the base, but only 4 to 5 feet in length.

The history of this specimen has, unfortunately, been lost, it is certain however that it was not in the collection in 1856 as it is not included in the list of Agaves compiled by J. Smith in his "Records of Kew." Mr. N. E. Brown, who came to Kew in 1873, says the plant was in the collection at that date and was then some 5–6 feet in diameter.

The name must be accepted with some reserve until the flowers appear as it differs in several respects from the wild specimens and from the original description of this species published in Hortus Dyckensis, p. 302.

C.P.R.

Kew Palace Linden.—A link with the past when Kew was a Royal domain disappears by the removal of this ancient specimen of Linden or Common Lime, *Tilia vulgaris*, Hayne. Growing on a

mound to the left of the entrance gates to Kew Palace from the riverside, the tree was described when in its prime, as a good specimen of singular beauty and great height. The girth of the trunk at 4 feet from the ground was 18 feet 7 inches. The tree is said to have been a favourite haunt with the children of George III when "pursuing their youthful studies." (*K.B.*, 1891, p. 318.) It is perhaps for this reason that in some books the tree is referred to as the "King's Lime." During a heavy storm on January 27, 1901, the tree suffered severely, all that remained was about 9 feet of the trunk. (*K.B.*, 1901, p. 86.) Being of historic interest the portion remaining was made to look presentable with the aid of a few bricks and cement. As evidence of the life left in the old tree two or three vigorous young shoots developed. It was one of these growths, coupled with the attack of fungus and decay of the heart-wood, which finally broke up the trunk. A strong wind during March of this year blew off one of the strongest growths, this unfortunately taking with it at least one-third of the trunk. As the tree was thereby reduced to a complete wreck the remains were cleared away on April 3 and burned.

A.O.

The Cricket-bat Willow.—A paper published in the *Kew Bulletin*, 1907, p. 311, dealt with the identity of the forms of *Salix* whose timbers are most prized by cricket-bat makers. It was there shown that the best of all willows for bat-making is a pyramidal-growing, female form of the blue willow (*Salix alba* var. *coerulea*), which, except for recent plantings, is only found in a few East Anglian counties. There was one interesting and important question which, for want of data, could not then be decided, this was whether restriction of the best cricket-bat willow to these eastern counties was due to its being a local variety, or perhaps hybrid, possessing by inheritance those peculiar qualities the cricket-bat maker desires; or, whether those qualities were due to, and dependent on, local conditions of climate or soil. As is well known the East Anglian climate is the driest and sunniest in the United Kingdom, and it was by no means certain in the opinion of several competent observers that the timber of the cricket-bat willow would retain its peculiar value if it were produced, say, in the warm, humid climate of Cornwall or in the somewhat similar conditions of the west of Scotland. Large numbers of cricket-bat willows have been planted during the past five years and it has become important to ascertain how far the labour and expense incurred in such districts is likely to be recompensed.

Through the kindness of Mr. J. Arthur Campbell we are able to give an encouraging report on some timber of cricket-bat willow grown on his estate at Arduaine, Lochgilphead, Argyllshire. Mr. Campbell, for experimental purposes, made a plantation there of about 150 trees in 1903 and 1904. One of these, planted in 1904, having attained a diameter in its trank of 6 to 7 inches he cut down and sent to Mr. D. J. Carter, willow dealer of Newtown, Waltham Cross, Herts, to ascertain its suitability and value for bat-making. Mr. Carter reported that it was perfectly satisfactory

and if of proper size for cricket-bat making (48 inches in circumference would have fetched the normal price per cubic foot. This timber, having been grown under a rainfall of about 60 inches per annum as compared with that of East Anglia, which is under 25 inches, appears to afford sufficient proof that its peculiar virtues are inherent and not necessarily dependent on its environment.

It need hardly be said that cutting down trees of the size of the one noted above is wasteful. So much greater is the proportion of woody tissue deposited on the trunk as the tree increases in size that, even allowing for compound interest, a loss is incurred by felling trees before they are 1½ to 2 feet in diameter of trunk.

In the article on this willow in the *Kew Bulletin* of 1907, it was suggested that its qualities were probably due to its remarkable vigour of growth. Whether this be so or not, there is no doubt that the timber of rapidly grown trees is better for the bat maker's purpose, and of greater value per cubic foot, than that of slowly grown, comparatively stunted trees which is contrary to what obtains with timbers in general. The best bat maker's timber is that in which the annual rings are not less than ½ inch wide. Trees on poor or comparatively dry ground will bring in neither so quick nor so large a return per cubic foot of timber as those grown on better, moister soil. This is a matter that should receive attention when a site is selected; further, any attention to the welfare of young trees will be repaid. Mr. Campbell believes that manuring the roots will prove profitable.

W. J. B.

Dendrobium Imthurnii.—In the description given of this new orchid in *K.B.*, 1912, p. 131, it was stated in error that its habitat was the Solomon Islands. We are informed by Sir Everard im Thurn that it was found near the Erakor Lagoon, Efate Island, New Hebrides.

Botanical Magazine for April.—The plants figured are *Schomburgkia Lueddemani*, Prill. (t. 8427); *Magnolia Kobus*, DC. (t. 8422); *Agave protuberans*, Engelm. (t. 8429); *Daphne retusa*, Hemsl. (t 8430) and *Campanula arvatica*, Lag. (t. 8431).

Schomburgkia Lueddemani is closely allied to *S. undulata*, Lindl., but differs in the colour of the flowers and especially in the bright yellow patch on the lip. The plant is of interest since it has been lost sight of since 1862, when it was described by M. Prilleux from a plant in the collection of M. Lüddeman in Paris. The plant figured was purchased for Kew from the collection of the Hon. W. Rothschild, Tring Park, and is reported to have come from Venezuela.

The *Magnolia* is a Japanese species and in its native country attains a height of over 70 feet and in this respect differs from its nearest allies *M. stellata*, Maxim. and *M. salicifolia*, Maxim., which are shrubby plants. The flowers are not very large. The species is known in two varieties and the one figured is a small growing tree and flowers freely; it was introduced to England about 1879 by Maries when collecting for Messrs. J. Veitch & Sons.

Agave protuberans differs from the true Agaves and from the Littaeas in having the flowers solitary on simple racemes or spikes and in having herbaceous leaves without a terminal spine. It belongs to the Manfredas, of which its near ally *A. virginica*, Linn., is a representative, and which may be regarded as a sub-genus of Agave. The leaves are covered with brownish-purple spots or blotches. The plant inhabits the mountains near San Luis Potosi, Mexico, at altitudes from 6000 to 8000 feet. The material for the figure was supplied by Mr. R. H. Beamish, Glounthane, near Cork and by Mr. H. J. Elwes, Colesborne.

The interesting *Daphne* was discovered by Mr. A. E. Pratt near Tatien-lu, W. Szechuan, between 9000 and 13,000 feet in 1889. Mr. Wilson collected it in 1903 in the same locality and from the material sent home to Messrs. J. Veitch & Sons at Coombe Wood the subject of the illustration has been derived. The pink flowers are produced in early May with the new leaves and are pleasantly fragrant.

Northern Spain is the home of the pretty little *Campanula* which forms the concluding subject of this number of the magazine. Though described in 1805 it was lost sight of and was re-discovered and again described as *C. acutangula* by Leresche and Levier in 1879. It appears to be most closely allied to the Tirolese *C. morettiana*, Reichb., but differs in being glabrous and in its smaller leaves and more broadly open flowers. The plant was purchased for the Kew collections from Mr. H. Correvon, Geneva.

Industrial Alcohol.—We are indebted to Mr. J. G. M'Intosh for pointing out that his book on this subject was omitted from the bibliography at the end of Mr. Holland's article on Alcohol in *K. B.*, No. 3, 1912, pp. 113–130. We regret this inadvertent omission and take this opportunity of giving some further references to works and papers which contain useful information on the subject.

Addenda to bibliography of works relating to the production of Alcohol, *K. B.*, No. 3, 1912, p. 130.

Barral, James, & Co., "Beetroot Distillation," pp. 1–126 (A. Schultze, London, 1870); including a "Report on the Subject by Dr. Augustus Voelcker, F.R.S.," pp. 19–49.

Harden, Dr. A. "Alcoholic Fermentation," pp. 1–128 (Longmans, Green & Co., London, 1911).

D'Hérelle, F. H., "Utilisation des Résidus de la Défibration des Agaves pour la Production de L'Alcool," in Journ. D'Agric. Tropicale, x., 1910, pp. 161–167.

Herrick, R. F., "Denatured or Industrial Alcohol," pp. 1–516 (John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1907).

Hough, W., "The Pulque of Mexico," in Proc. U.S. National Museum, xxxiii. 1908, pp. 577–592, figs. 1–19.

M'Intosh, J. G., "Industrial Alcohol: A Practical Manual on the Production and Use of Alcohol for Industrial Purposes and for Use as a Heating Agent, as an Illuminant and as a Source of Motive Power," pp. 1–250, with 75 Illustrations and 25 Tables (Scott, Greenwood & Son, London, 1907).

Malpeaux, L., "La Betterave de Distillerie et la Betterave Fourragère," pp. 1–194, figs. 1–15 (Masson & Co., Paris).
Perkins, A. J., "Report on the Amount of Spirits that may be extracted from a Ton of Raisins," in Journ. Agric. S. Australia, xiii., 1909, pp. 192–198.
Pharmaceutical Journal, xx., 1905, "Alcohol for Industrial Purposes," pp. 590–591 ; pp. 621–623.
Voelcker, Dr. A., "On the Cultivation and Uses of Sugar-beet in England," in Journ. Soc. Arts, xix., 1871, pp. 307–318, including "Beet-root Distillation," pp. 314–316.
Voelcker, Dr. A., "On Sugar-beets and Beet-root Distillation," in Journ. Roy. Agric. Soc., vii., 1871, pp. 60–85.
Wright, F. B., "A Practical Handbook on the Distillation of Alcohol from Farm Products and the Denaturing of Alcohol," pp. 1–194, figs. 1–33 (Spon & Chamberlain, New York : E. & F. N. Spon, Ltd., London, 1906).

St. Kitts Sugar Factory.—We learn with interest from the Agricultural News, vol. xi., no. 259 (March 30th), p. 99, that the new Central Sugar Factory in St. Kitts was formally opened on February 20th, 1912, in the presence of the Administrator of St. Kitts, His Honour T. L. Roxburgh, C.M.G., the Imperial Commissioner of Agriculture, Dr. F. Watts, C.M.G., and many others.

The Central Sugar Factory at Gunthorpes, Antigua, opened in 1904, which was established largely owing to the energy and foresight of Dr. Watts, has fully justified the expectations of its promoters and the formation of the factory in St. Kitts is the result of its uninterrupted career of successful operation. There seems every reason to anticipate that the new factory will add materially to the prosperity of the Presidency of St. Kitts-Nevis.

The following particulars are taken from Mr. Tempany's account in the Agricultural News :—

The factory "is situated in the Basseterre valley, about 1 mile from the town, and its cane supply is at present derived from the estates situated in the valley adjoining it, and on the leeward coast of the island. It is contemplated that during coming years the operations of the factory will be extended to include a considerable number of the estates on the windward side of the island. The plant is of modern design, Messrs. Mirrlees, Watson & Co., Ltd., of Glasgow, being responsible for its construction.

"The mill is of the fourteen-roller pattern, comprising a Krajewski crusher and a train of four three-roller mills. It is estimated that the factory is at present capable of producing 8000 tons of grey crystal sugar, but provision is made for further extension to 10,000 to 12,000 tons, as its maximum output."

As Mr. Tempany justly observes "The event must rank as one of the first importance in the history of the Leeward Island Colony, marking as it does a further step in the transition from old-fashioned methods of sugar manufacture to those that are modern and economical."

Kerstingiella geocarpa.

Malby & Sons, Lith.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 5.] [1912.

XXIII.—A NEW GROUND BEAN.

(*Kerstingiella geocarpa*, Harms.)

With a Note on the Discovery of Voandzeia Subterranea in the Wild State.

O. Stapf.

Three years ago Professor H. Harms* described a new genus of *Leguminosae* which he called *Kerstingiella* after its discoverer, Dr. Kersting of Sokodé, Togoland. Apart from the strictly botanical interest attaching to it, it was remarkable as the source of a ground bean or nut which had been until then unnoticed, although its cultivation in Upper Guinea as we now know extends over a fairly large area. In 1910 Dr. A. Chevalier† recorded the same plant from Dahomey, describing it as a new species of *Voandzeia* under the name *V. Poissonii*. Since then it has been in cultivation and under observation in the Botanic Gardens at Dahlem and Jena, and last year Professor Harms‡ published a short article in which he summarised briefly what was then known about this ground bean, adding some valuable information concerning the conditions of its cultivation.

Chevalier§ states that Hausa traders assured him of the existence of the bean in British Nigeria. This statement is confirmed by specimens of *Kerstingiella* communicated to Kew by Mr. W. R. Elliot, who came across it as a field crop in Nupe. The plant is undoubtedly of some economic importance and it seems desirable to call the attention of British residents and travellers in Nigeria to the occurrence of this ground bean in order to ascertain its distribution in that colony and to gather further information about its cultivation and economic uses, and also, if possible, to discover it in the wild state in which it has not so far been observed.

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* Harms in Berichte d. Deutsch. Bot. Gesellschaft, vol. xxvi., a, p. 230, tab. iii.

† A. Chevalier in Compt. Rend., vol. cli., p. 84.

‡ Harms in Deutsche Kolonialzeitung, vol. xxviii, p. 160; reprinted in Tropenpfl., vol. xv., p. 273.

§ Chevalier in Compt. Rend., vol. cli., p. 1374.

(24254—6*a*.) Wt. 189—808. 1125. 6/12. D & S.

The purpose thus outlined will be best served by a translation of Professor Harms' summary mentioned above with a description of the plant and some observations on its morphological and biological peculiarities mainly quoted from the same author's earlier paper together with a list of vernacular names.

Distribution.

"Two years ago I called attention to an important botanical discovery by Dr. Kersting, who, in the northern territory of Sokode-Basari, Togoland, came across an especially interesting new kind of bean which matured its pods below, instead of above ground. The well-known ground nut (*Arachis hypogaea*), and the peanut (*Voandzeia subterranea*), are similar instances. Kersting found that the natives of Togoland cultivated the bean, which they called Kandela in three varieties distinguished by their colours. I described this bean which is not known in the wild state, as *Kerstingiella geocarpa*, the type of a new genus of *Leguminosae*.

"In July, 1910, Aug. Chevalier, the indefatigable African explorer, reported the existence in Dahomey of a plant which, to judge from the description, was very similar to, if not identical with, Kersting's bean. He named it *Voandzeia Poissoni*, a new species of the genus of the peanuts, giving the Dahomey name as 'Doi.' The beans are sold in the market of Abomey by the natives, who grow them largely. There were also here colour varieties (white, black† and mottled). An account may be found in Quinzaine Coloniale, 1910, No. 16, p. 590. Chevalier's description suggested at once the identity of the Dahomey and the Togo bean. M. Chevalier was, on his return from Africa, good enough to send me a specimen of his Dahomey plant whilst I supplied him with material from Togoland and our comparisons proved that the two beans were actually identical, or in other words that the Togo bean extended into Dahomey and M. Chevalier has already stated (Compt. Rend. l.c., p. 1374) that he too considers his species as identical with *Kerstingiella geocarpa*. He gives an important account of its distribution in Dahomey, quoting various vernacular names. The species is also said to occur in British Nigeria, but up to the present I have seen no specimen from there. In Togo as well as in Dahomey the plant is known only in the cultivated state, which renders Kersting's and Chevalier's discoveries the more remarkable.

"Chevalier gives analyses (l.c. 1375) which show that the nutritious value of the beans is very considerable. They are said to equal the richest peanuts in nitrogenous matter, whilst they have at the same time a more pleasant taste, particularly for Europeans, recalling that of the finest varieties of beans. The yield, owing to the smallness of the seeds (8–10 cm. by 6–7 mm.), is not large. In Dahomey according to the French explorer, the women are forbidden to eat the beans.

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* On the distribution of *Kerstingiella geocarpa* in tropical Africa (by Harms in Deutsche Kolonialzeitung, vol. xxviii., p. 160).

† Or red (Chevalier l.c., p. 86).

"Last year (1910), thanks to the kindness of First Lieutenant Häring of Sokodé-Basari (Togo), the Botanic Garden at Dahlem near Berlin received excellent seeds of this remarkable fruit. They germinated well and numerous plants were raised by Chief-Inspector F. Ledien, not a few of them flowering in July and August. A number of seeds were sent to Inspector E. Rettig of the Botanic Garden at Jena, and under his careful and intelligent treatment, splendid specimens grew up of which some even set fruit. The unfavourable cold and dull summer of 1910, however, prevented their maturation. The flowers are very small and papilionaceous and spring from the creeping stem close to the ground. The flowers of the variety with light or occasionally black-mottled seeds are white, those of the other varieties pale violet.

"It is desirable to follow up the distribution of this cultivation, particularly among the natives in Togo, where it may also be found in the wild state. Similarly *Voandzeia subterranea*, so generally cultivated in Togo, has never been observed in the spontaneous condition. It is also possible that *Kerstingiella* occurs in the Hinterland of the Cameroons (Adamaua, Zola, Garua, &c.). Chevalier states that the Hausa traders contended that it existed in British Nigeria, and the probability that the Hausa people were instrumental in the spreading of the cultivation is obvious. The Hausas call it Kouarourou according to Chevalier. It is also said to occur in Borgu. It is true, at the first glance it might be mistaken for *Voandzeia subterranea* and Schweinfurth actually suggests that this has been the case with certain writers (Zeitschrift d. Gesellschaft f. Erdkunde, 1910), but the expert will always distinguish them. Habit and leaves are similar and yet distinct, and *Voandzeia*, so long and so well known to us, has above all much larger globose seeds.

"In any case, I should be very grateful for any communications concerning *Kerstingiella* or *Voandzeia*, their cultivation and use, and particularly if they are accompanied by flowers, fruits and seeds. Material of this kind would enable us to establish the distribution of the plant. *Kerstingiella* might possibly also be grown with advantage in other parts of our colonies. Moist and hot countries do not suit it; in Togo it occurs according to Kersting in sandy laterite loam, in a climate of low humidity with occasional heavy showers and a shade temperature of 18°–34° C."

Morphology and Biology.

As there is only one specimen of *Kerstingiella geocarpa* in the Kew Herbarium—and this only in the fruiting stage—the following description and observations are mainly taken from Harms' paper in the Berichte der Deutschen Botanischen Gesellschaft.

A prostrate herb. Taproot with slender branches sometimes bearing nodules. Main stem creeping, 5–8 cm. long, hirsute-pubescent or nearly glabrous, rooting from the nodes, emitting numerous short stolons with approximate nodes and mostly bearing leaves which are reduced to the stipules (Chevalier). Normal leaves 3-foliolate, borne on upright, pubescent petioles, 6–12 or, according to Harms, as much

as 23 cm. long; leaflets petiolulate, broadly ovate or obovate, more or less rounded at the base, obtuse, 5–8 cm. long, 3–5·5 cm. wide, hirsute-pubescent, or finely ciliate when young (Chevalier), finally glabrous; stipules deltoid-ovate 4–6 mm. long, pubescent, striate; stipellae linear. Flowers small, in pairs or, by abortion, solitary in the axils of the leaves, subsessile, with a pair of lanceolate bracteoles at the base. Calyx hirsute-pubescent, with a cupuliform tube and sub-equal linear, acuminate segments, almost twice as long as the tube, the posticous segments united up to or beyond the middle and slightly longer than the lateral. Corolla shortly exserted from the calyx, glabrous, greenish-white excepting the pale violet tip of the standard, 0·8–1 cm. long; standard obovate to suborbicular, emarginate, shortly or obliquely clawed; wings narrow, oblong, obtuse, shortly clawed; keel oblong, obtuse, slightly curved, exceeding the wings, its petals cohering at the middle. Filaments connate with the exception of the posticous one which is free; anthers small, shortly ellipsoid. Disc posticous, short. Ovary shortly stipitate, glabrous or nearly so; style gently curved, laterally somewhat compressed, glabrous; stigma terminal, capitate, finely ciliate; ovules usually 2; stipes after fertilisation lengthening into a carpopodium 1·5–3 cm. long and burying the ripening pod in the ground. Mature pod indehiscent, 1·3–2 cm. long, 0·7–1 cm. wide, usually divided by a constriction (rarely 2), and a corresponding thin septum into 2 (rarely 3) joints, or it may be simple, slightly curved, glabrous; pericarp thin, crustaceous, slightly rugose. Seeds oblong or oblong ovoid, 6–7 mm. long, 5 mm. wide; testa thin, white, red, black or mottled; hilum small, linear-oblong, whitish; radicle lateral, short, conical.

As the resemblance between *Kerstingiella* and *Voandzeia subterranea* (at least in its broad-leaved states), is considerable and the two have actually been confused, it may be useful to point out the following differences.

Kerstingiella geocarpa.	*Voandzeia subterranea.*
Flowers subsessile in the axils of the leaves, paired or solitary without a distinct common peduncle.	*Flowers* usually in pairs on a common, more or less hairy, peduncle terminating with a callous swelling.
Calyx deeply divided, with narrow, linear, subequal segments.	*Calyx* with short, broad and unequal teeth.
Style glabrous.	*Style* hairy on the inner side upwards.
Stigma terminal, capitate.	*Stigma* lateral, below the pointed apex of the style.
Stipes of pistil lengthening considerably after fertilisation.	*Pistil* without a stipes.
Seeds oblong-ellipsoid, 6–7 mm. by 5 mm.	*Seeds* globose - ellipsoid, 1–1·5 cm. by 0·9–1·05 cm.

The mechanism by which the pods of *Kerstingiella* become buried in the ground is very singular and almost unique in *Leguminosae*. When the flowers, which seem to be chasmogamous, are fully developed, they are close to the ground. After fertilisation the solid base or stipes of the pistil, which in the flower is very short,

lengthens into a carpopodium and at the same time turns towards the ground; then the corolla and the style are thrown off. The ovary, still very small, is pushed out of the calyx, and by the root-like carpopodium gradually driven into the ground, where finally the growth and the maturation of the ovary into the seed-bearing pod takes place.

Vernacular Names.

Dr. Kersting states that the bean is called "Kandela" in the Sokode-Basari District in Northern Togoland, whilst Chevalier quotes the following names:—Doi and Nadou (Dahomey); Dieguem tenguéré (Mossé), Kouarourou (Hausa), Dougoufalo (Bambara) and Bindi (Baunnako).

The specimen collected by Mr. W. R. Elliot in Nupe bears the name "Pararu."* This has been referred to *Voandzeia subterranea* by Mr. J. H. Holland in "The Useful Plants of Nigeria" (*Kew Bull.* Add. Ser. ix., part ii., p. 232). Dr. Dalziel's Kawaruru (Holland, l.c.) from Kontagora is evidently the same as Chevalier's Kouarourou, mentioned above.

II. DISCOVERY OF VOANDZEIA SUBTERRANEA IN THE WILD STATE.

This plant, so widely cultivated in Africa and in other parts of the tropics has up till recently been unknown in the wild state, although everything pointed to the fact that it had its origin in Tropical Africa. The question seems now to be definitely solved by the simultaneous discovery in August, 1909, of the wild form by Dr. Dalziel in the bush in the Kilba country, north of Yola, and close to the frontier of German Adamaua, and by C. Ledermann, near Garua in German Adamaua. The specimens differ in no way from the narrow-leaved states of the cultivated *Voandzeia*, excepting in the more slender character of the stolons, peduncles and pedicels, and the short petiolule of the terminal leaflet. In neither case, however, were fruits collected. Kew is indebted to Dr. H. Harms for a specimen of Ledermann's plant and information about it.

Explanation of Plate.

The figures have been reproduced from the Berichte d. Deutschen Botanischen Gesellschaft, vol. xxvi. a, tab. III., by the kind permission of the secretary and the author:—(1) The plant, with fruits and flowers; (2) a flower; (3) a calyx, laid open; (4) a standard; (5) one of the wings; (6) keel; (7) pistil; (8 and 9) advanced stages of the pistil with enlarged stipes; (10) a pod, not quite mature, cut open; (11) seed, seen from the hilum side; (12) the same in side view; (13) embryo.

All enlarged, excepting 1, 11, and 12 which are natural size.

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* This is given as the Hausa name of *Voandzeia* by Dudgeon (The Agric. and Forest Prod. of Brit. West Africa, p. 152), and a sample of Paruru seeds in the Imperial Institute, collected by Dudgeon, is undoubtedly *Voandzeia subterrannea*

XXIV.—NOTES ON SOME NEW AND CRITICAL PLANTS FROM EASTERN ASIA.

H. Takeda.

During the time that I have been engaged in a study of some Japanese plants in the Kew Herbarium, I have noticed several which have either required critical revision or have been left undescribed. In this short paper only certain plants belonging to six genera are dealt with, which for the sake of convenience are arranged alphabetically.

Arisaema.

Several names have been proposed for the various forms of *Arisaema japonicum* and *A. serratum*. Different views in classification have also been put forward by not a few botanists. These two plants have been known to us from the time, previous to Kaempfer's visit in the year 1690; he saw the former plant and referred to it in his book under the name of '*Nansoo, &c.* . . .'* Thunberg† considered the same plant to be *Arum Dracunculus*, Linn., which is now known as *Dracunculus vulgaris*, Schott. Blume was the first to give a correct name to this plant and called it *Arisaema japonicum*.‡ Thunberg also described§ and figured‖ the other plant under the name of *Arum serratum*, the name afterwards altered by Schott¶ into *Arisaema serratum*.

Now the distinguishing characters used by botanists both in Japan and in Europe, were in the first place the serration of the leaf-margin and also the dark purplish colouring of various parts of the plant of *A. serratum*, while in *A. japonicum* the leaf-margin is entire and a greenish colour is prevalent. If it were only so, Engler's reduction** of *A. serratum* to *A. japonicum* as a variety would hold good. These characters, however, are not at all constant, since one comes across a specimen with a green flower (in the broadest sense), the leaf of which has conspicuous serration on the margin, or *vice versa*. After a comparison of a great many specimens obtained from different parts of Japan, Makino came to the conclusion that these two plants are merely forms of one and the same species.†† He adopted the oldest name *serratum*, for the specific name of the plant in question, and called the serrated-leaved form forma *Thunbergii*, and the other forma *Blumei*.

The question seemed to have been settled then, and we followed this view.

In the year 1906, I had an opportunity of collecting a good many specimens of these plants in several places of Central as well as Northern Japan. Examining those specimens, it struck me, that

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* Kaempfer, Amoenit. Exotic., p. 786. (1712).
† Thunb. Fl. Japon., p. 233 (1784).
‡ Blume, in Rumphia, i, p. 106 (1835).
§ Thunb. in Trans. Linn. Soc., ii, p. 338 (1793).
‖ Thunb. Ic. Pl. Japon., iv, tab. 7.
¶ Schott, Meletem. Bot., i, p. 17 (1832).
** Engl. in DC. Monogr. Phan. Aroid., p. 549.
†† Makino, in Tôkyô Bot. Mag., xv, pp. 128, 129 (1901).

there exist certain other characters, by which we can distinguish two different plants. Owing to the encouragement I have received from Mr. T. Makino, I continued my investigations and came to the conclusion, that *A. serratum* and *A. japonicum* must be regarded as two distinct species. Recently I was able to examine a number of specimens preserved in the Kew Herbarium, some of which have been referred to by the previous workers. The result of this comparison agreed very well with that of my former study, and seems to me not to be superfluous to publish here. The principal points by which we can distinguish these two species are as follows :—

The central one of the pedately-arranged leaflets :
- more or less long-stalked ... ... *A. japonicum*
- generally sessile or shortly stalked ... *A. serratum*

The elongate appendage of the spadix :
- slender and sometimes more or less attenuated towards the apex and slightly curved ... ... *A. japonicum*
- stout, clavate, more or less thickened at the apex ... ... *A. serratum*

The tubular part of the spathe :
- cylindrical, slightly recurved at the mouth, generally longer than the lamina ... ... *A. japonicum*
- infundibuliform, much recurved at the mouth, generally equal in length to the lamina ... ... *A. serratum*

The characteristics represented by the flower are well marked in living specimens, but are rather obliterated by pressing them. The colour of the flower and of the patches on the stem is but little reliable, since there often occurs an intermediate condition, and also it shows a certain degree of modification every year. The serration on the leaf-margin does not afford a character distinguishing for species or varieties in many species of *Arisaema*. As in these two plants, Engler regards the serration as a principal character distinguishing *A. Sazensoo* from *A. amurense*.* In nature these plants have sometimes entire leaves and sometimes serrated leaves. Whether the serration is constant in a certain form of one species or varies from year to year, I have no record. However, it would not be at all surprising, should one plant produce entire leaves in one year and serrated leaves in the next, since certain species of this genus possess the remarkable character of changing not only the colour but even the sex.

The change of sex is not much known, still I have observed it in *A. japonicum* and in *A. ringens*. As is generally known the great majority of the species of this genus are dioecious, but from a plant bearing female flowers in one year, it may be possible to obtain in the next year a plant bearing male flowers from the same corm. In such a case the plant generally gets smaller and slenderer than it was ; and in general, the male plant is smaller than the female. It appears to me, that the question of sex in this genus is determined

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* Engl., l.c., p. 550.

by the amount of nutrition which a plant obtains from soil. It sometimes happens that a particularly well developed specimen of a dioecious species may become monoecious, and I have observed such a case in *A. Thunbergii* and in *A. heterophylla*. With regard to these interesting phenomena, further observations and experiments are very much to be desired.

A. serratum grows in Central and South-Western Japan, while *A. japonicum* is widely distributed nearly all over the country and also even in China, Corea and in Manchuria. Where these two species occur together, hybridisation seems to take place between them. One sometimes comes across an intermediate form about which it is by no means easy to decide from herbarium material.

In conclusion I may perhaps mention here the nomenclature and also the specimens represented in the Kew Herbarium.

Arisaema japonicum.—*Blume*, in Rumphia, i, 106 (1835). *A. amplissimum*, Bl.; Miq. Prol., p. 134. *A. latisectum*, Bl.; Miq., l.c. *A. japonicum* var. *angustifoliolata*, Miq., l.c., p. 375. *A. japonicum* var. *latisectum*, Miq., l.c. *A. japonicum* var. *latifoliolata*, Schott. *A. serratum* forma *Blumei*, Makino, in Tôkyô Bot. Mag., 1901, p. 129, partim. *A. angustatum*, Fr. et Sav. Enum. Pl. Japon., ii., pp. 3, 507.

Japan. Without definite locality, ex Herb. Lugduno-Batav., *J. Small*, 1853; Nagasaki, *Maximowicz*, 1863,* *Oldham*, n. 818; Tônosawa, *Dickins*, 1881; Shimura, ex Herb. Tôkyô, 1885; Nikkô, *Bisset*, 1221; Hakone, Challenger Exped., 1875; Hakodate, *C. P. Hodgson*, 1860; Fukuyama, *Faurie*, 3813; Nanokawa, *K. Watanabe*, 1896; Chichibu, *K. Watanabe*, 1895; central mountains, *Maries*.

China. Hupeh, *Henry*, 5371; Tientai Mt., prov. Chekiang, *Faber*, 1889. Kew, cult., type of Bot. Mag., 610–2130 m., 7916.

Arisaema serratum, *Schott*, in Melet. Bot. i, p. 17 (1832). *Arum serratum*, Thunb. in Trans. Linn. Soc. ii, p. 338 (1793); Ic. Pl. Japon, iv, tab. 7. *Arisaema japonicum* var. *serratum*, Engl., l.c. p. 549. *A. serratum* forma *Thunbergii*, Makino, l.c. p. 128, partim.

Japan. Tônosawa: Hakone, *Dickins*, 1881; Chichibu, prov. Musashi, *Watanabe*, 1895.

There is a specimen at Kew collected by Maximowicz at Hakodate in the year 1861, and named *Arisaema japonicum*, Bl. var. *atro-purpureum*, Engl., and there is also another specimen of the same plant collected at the same locality by Hodgson in the previous year. These two specimens do not really belong to *A. japonicum*, but represent an interesting species called *A. Takedai*, Makino,* which seems to me to come nearer to *A. serratum* than to *A. japonicum*. I discovered this plant at Nikkô in July 1903, and it is now found to be distributed in Yezo also. The plant is stout, with a thick, more or less fleshy leaf, undulate on the margin; the spathe is very large and deep purple in colour.

Both *Arisaema japonicum* and *A. Takedai* produce bulbils on the corm, while, so far as I am aware, they are absent in *A. serratum*.

As a rule, herbarium specimens do not show this point, so that, at present, I am unable to be precise about this character.

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* Makino, in Tôkyô Bot. Mag., xxiv, p. 73.

Calamagrostis.

About a dozen species of this genus were recognised by Hackel as natives of Japan, when he published the "Enumeratio Graminum Japoniae." * In the year 1910 I added† seven new species to the flora of Japan, and at present twenty species are known to us. Hackel‡ reduced *C. hakonensis*, Fr. et Sav., to *C. sachalinensis*, Fr. Schm., adopting the latter name for this species. Some time ago I had occasion to examine Schmidt's original specimen of *C. sachalinensis*, and compared it with a specimen collected by Mr. Dickins, and named *C. hakonensis*. Although these two plants are so alike, yet there are some marked characters by which the two species may be easily distinguished. From an examination of several specimens, I am led to the conclusion that *C. hakonensis* should be retained as a distinct species.

The chief points of distinction of these two plants are as follows :—

Calamagrostis sachalinensis, *Fr. Schm.*, Reis. Amurl. Sachal. p. 202, tab. 8, fig. 8–14.

Dense caespitosa ; foliis in sicco plerumque planis, vagina glaberrima, ligula brevi saepe in foliis superioribus brevissima ; glumis sterilibus inaequalibus, II^{da} brevi, glumam fertilem aequanti vel longiore.

Japan. Ganju, *Faurie*, 13,656 ; Rishiri, *Faurie*, 8424 ; Rebun, *Faurie*, 8548. Saghalien, *Fr. Schmidt*.

Calamagrostis hakonensis, *Fr. et Sav.*, Enum. Pl. Japon. ii, pp. 168, 599.

Speciei praecedenti valde affinis, sed ab ea foliis in sicco saepius convolutis, basi externe annulo pilorum cinctis, vagina villosula, ligula plerumque producta, glumis sterilibus aequalibus, carina scabra differt.

Japan. Ad basin Fuji, *Dickins*, x. 1881 ; Osorezan, *Faurie*, 4599 ; Hakodate, *Maximowicz*, 1861 ; Otaru, *Faurie*, 1362, 2879, et 3088 ; Mombetsu, *Faurie*, 1002.

When describing *C. variiglumis*, in my paper, I stated that my plant differs from *C. sachalinensis* in certain points. This is certainly not quite correct, since I mean *C. hakonensis* with *C. sachalinensis*.

When describing my *C. nana*, I was not able to find out any allied species, but last year I found a few specimens at Kew, which are so similar to my plant, that I could not draw any specific distinction between them. In consequence, my plant is to be regarded as follows :—

Calamagrostis deschampsioides, *Trin.*, Spec. Gram. Ic. et Desc. iii, sub tab. 354. Ledeb. Fl. Ross. iv, p. 427.

Var. **nana**, *Takeda*.

A planta typica foliorum laminis longioribus vaginas excedentibus, glumis sterilibus paulo inaequalibus, arista breviore distinguitur.

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* Hackel, in Bull. Herb. Boiss., vii, 1899.
† Takeda, in Tôkyô Bot. Mag., xxiv, No. 277.
‡ Hackel, l.c. p. 650.

Japan. Yatsugatake, *T. Yamanaka*, 1906!; Higashi-Komagatake, *H. Takeda*, 1906.

The type form is distributed in Kamtschatca, Behring, Baical, and Arctic Russia, while the variety is known at present only from the Alpine region of high mountains of Central Japan.

Caltha.

The following new form of *Caltha palustris* from China has been observed in the Kew Herbarium, a description of which is given below.

Caltha palustris, *L.* var. **sibirica**, *Regel*, Pl. Radd. i, p. 53 ; subvar. **palmata**, *Takeda*.

Caulis adscendens vel erectiusculus, gracilis, elatus, usque 40 cm. altus, uni- vel bifoliatus. *Folia* crassiuscula, radicalia petiolata, oblongo-ovata vel ovato-orbiculata, lobis basilaribus conniventibus, circumcirca crenato-dentata, caulina ambitu reniformia, basi profunde et aperte cordata, profunde palmato-incisa vel laciniata, lobis argute pauciserratis. *Flores* mediocres, 3–3·5 cm. diam., plus minus longe pedunculati, bracteis ambitu cordato-ovatis, fere palmatilobis, laciniis angustis integris pauciserratisve. *Carpella* 7–10, in stylum brevem attenuata, submatura erecta.

China. Yunnan : Mengtze ; mountain marshes, 1980 m., rare, *W. Hancock*, 164 ; Yunnan, *Fr. Ducloux*, 3294, *Delavay*, 1084.

Glaucidium.

This genus, established by Siebold and Zuccarini,* was based on specimens collected in Yezo, Japan. As these botanists had but a few specimens with fully opened flowers, they could not give a satisfactory description of the genus, and they doubted whether the whorl of the perianth represented the calyx, the corolla being wanting, or whether the calyx was caducous, and did not remain on the fully opened flowers. The true nature of the perianth was correctly described by Bentham and Hooker† and by Baillon.‡ There still remained an error with regard to the arrangement of ovules on the placenta, which was pointed out by Finet and Gagnepain.§ The argument made use of by these French botanists is quite correct, since the ovules are biseriate and not multiseriate on the placenta.

Now, there is only one species of this genus called *G. palmatum*,* which is found in Yezo as well as on the mountains of Central Japan.

A new species, *G. pinnatum*, from the province of Ssuchuen, China, was added to this monotypic genus by Finet and Gagnepain.‖ The figures given by these French authors strongly suggest that the plant in question possesses all the characteristics of a Papaveraceous plant known as *Hylomecon japonicum*, Prantl (syn. *Chelidonium japonicum*, Thunb., *Stylophorum japonicum*, Miq., *Chelidonium*

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* Sieb. et Zucc. Florae Japon. Fam. Nat., n. 185 (1845).
† Benth. et Hook. Genera, Pl. i, p. 7.
‡ Baill. Hist. des Pl., i, p. 85 (1867).
§ Finet et Gagn. in Bull. Soc. Bot. France, li, p. 391 (1904).
‖ Finet et Gagn. l.c., p. 392, tab. iv, fig. A. *a*—*c*.

uniflorum, S. et Z. and *Hylomecon vernale*, Maxim.), which is distributed throughout the Far East. The only points which contradict my supposition are that this Chinese species has (1) no radical leaf, (2) only four sepals but no petals, and (3) biseriate ovules. The first and second points are most probably due to the imperfections of the specimen which came into the hands of these authors. The description and figures of the ovary given by the French authors are puzzling, since they point to an intermediate character between *Ranunculaceae* and *Papaveraceae*. One unmistakable character of *Papaveraceae*, however, is well represented by the stamen of the plant in question. The filament tapers towards the apex, and does not continue to the connective, as the French authors describe and figure. Another objection against referring the plant to *Glaucidium* is the absence of a bract below the flower.

Anyone who compares the figures of *Glaucidium pinnatum* with those of *Hylomecon japonicum*, published either in the Botanical Magazine, tab. 5830, or in Maximowicz's "Primitae Florae Amurensis," tab. 3, will probably agree with my view, even without dissecting the flower.

Another remarkable species, *G. paradoxum*, was described by Makino.* This species is distinguished from *G. palmatum* mainly by having four carpels (two of these are said to be abortive), and by some of the stamens being malformed and assuming a carpel-like appearance. This is certainly a peculiar, but not at all a surprising phenomenon amongst *Ranunculaceae*. It is well known that the stamens of various members of this family are often metamorphosed into petaloid forms. It would not therefore be at all surprising should four normal carpels occur in *Glaucidium palmatum*, because this plant, which normally has two carpels slightly connate at the base, has often only a single carpel, and sometimes may have as many as three. As the author suggests, the specimen he examined is evidently a monstrous form of *G. palmatum*, and not a distinct valid species.

Although this pluricarpellar malformation suggests an apparent similarity between this genus and the North American *Hydrastis*, these two genera cannot be united, since the structure of the gynœcium is totally different in the two.

The flower of *G. palmatum* is usually solitary, but in a vigorous plant there sometimes occur two flowers borne at the summit of the stem, and then the bract is common to the two flowers.

A species of *Hydrastis* was recorded from Japan, under the name of *H. jesoensis*, Sieb., a very brief description of which is given by Miquel.† Prantl,‡ usually a careful botanist, accepted this species. Huth§ entertained doubts about it, and suggested that it might be a species of *Glaucidium*, though not *G. palmatum*. Miquel's description of this doubtful plant is very vague, still there one can perceive a characteristic of *Glaucidium* in it, as he says, ". . . carpellis 2 . . . basi inter se connatis, ..." This does not occur in *Hydrastis*, but does in *Glaucidium*. I have no doubt that this

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* Makino, in Tôkyô Bot. Mag., xxiv, p. 71 (1910).
† Miquel, Prol. Fl. Japon., p. 369.
‡ Prantl, in Engl. u. Pr. Natürl. Pflanzen-Fam., iii, 2, p. 55.
§ Huth, in Engl. Bot. Jahrb., xvi, pp. 292, 293.

plant is nothing but *Glaucidium palmatum*, a deflorous specimen of which was mistaken by both Siebold and Miquel to be a species of *Hydrastis*.

It would be very inconvenient to a student of botany should such plants as *Glaucidium pinnatum* or *Hydrastis jesoensis*, which only exist in herbaria or in literature, be taken as examples in a phyto-geographical work, and erroneous conclusions be drawn therefrom.

Leucothoë.

A very interesting case of the occurrence of a N. American genus *Leucothoë* in Japan was first made known by A. Gray in the year 1859.* He described the plant as a new species calling it *L. chlorantha* on account of the flower colour mentioned by the collector. He probably did not notice that there was another plant belonging to the same family with the same name, which is sometimes referred to a different genus as *Agarista chlorantha*. For this reason Maximowicz changed the specific name to *Grayana* in 1872.† H. de Boissieu is wrong, when he says " . . plantae a C. Wright in itinere Japonico lectae, et ab A. Gray, Bot. Jap. sub nomine *L. chloranthae*, DC. enumeratae. Huic a *L. chlorantha* vera alienae, Max. l.c. merito nomen *L. Grayanae* dedit, . . ."‡, because there is no evidence that Gray took our plant for the South American plant and enumerated it as De Candalle's species. Perhaps Grays original paper was not at Boissieu's disposal, and his remark was derived from a wrong source.

Maximowicz† added a new species called *L. Tschonoskii*, which is very closely related to the former species, but differs from it in a few not very conspicuous points. In "Les Ericacées du Japon," H. de Boissieu§ enumerates two species of this genus: 1, *L. Tschonoskii*, and 2, *L. Grayana*, Maxim. He remarks under the former species "a specie sequenti *foliorum et collorae forma tantum*, sed, ut mihi videtur, sat distincta." As he had a good many specimens of the latter species, he was able to break it up into three varieties: α, *typica*, β, *intermedia*, and γ, *Wrightiana*.

It seems to me that these authors lay too much stress on the form and texture of the leaf as a ground for separating species and varieties. But if they once visited the places where *L. Grayana* grows and examined living specimens, they would assuredly change their opinion. In fact in Japan there are only two species of this genus: one is *L. Keiskei*, Miq.‖ and the other is *L. Grayana*, Maxim. These two are endemic in Japan; the former is distributed over Central and South Western Japan, the latter in Central and Northern Japan.

L. Keiskei scarcely varies, while *L. Grayana* is very polymorphic. As pointed out above, it is not safe to attempt to distinguish forms by the shape and texture of the leaf. Maximowicz also separates *L. Tschonoskii* from *L. Grayana* by the character of the corolla,

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* A. Gr. Botany of Japan, p. 399.
† Maxim. in Mel. Biol., viii, p. 613.
‡ H. de Boiss. in Bull. Herb. Boiss., v, p. 911 (1897).
§ Boiss., l.c.
‖ Miq. in Ann. Mus. Bot. Lugd.-Bat., i, p. 32.

which in the former plant is ovoid-globose, while in the latter it is globose. This character, however, depends upon the time of flowering, both types of corolla can be found on one and the same species. Such a slight variation is quite insufficient ground for distinguishing species. The last characteristic of *L. Tschonoskii* given by Maximowicz is the pubescence of the ovary. Still as Boissieu* points out, the hairy ovary occurs also in certain forms of *L. Grayana*.

In reality the hairiness of the ovary is the important character of the variety of *L. Grayana*, and the leaf has here no significance whatever.

The species should, therefore, be arranged as follows :—

Leucothoë Grayana, *Maxim.*, emend. *α* **Maximowicziana**, *Takeda.*, *L. Grayana*, Maxim. in Mél. Biol., viii, p. 613. *L. Grayana*, *α typica*, Boiss. in Bull. Herb. Boiss., v, p. 911.

Ovario glabro.

β. **Tschonoskii**, *Takeda.*, *L. Tschonoskii*, Maxim., l.c., *L. Grayana* β *intermedia* et γ *Wrightiana*, Boiss., l.c.

Ovario styloque pubescente.

It seems to me probable that C. Wright collected several specimens of this plant in the neighbourhood of Hakodate, most of which are probably the variety *α*, from which this species was described by A. Gray and Maximowicz. A few must be the variety β, on which Boissieu established his var. *Wrightiana*.

Tripterygium.

This very interesting genus of *Celastraceae* was discovered by Wilford in Formosa in the year 1858. Sir J. D. Hooker described the plant under the name of *T. Wilfordi*.† Several years later a second species, *T. Bullockii*, was published by H. F. Hance,‡ which is said to differ from *T. Wilfordi* in having a 6-lobed stigma and branchlets covered with ferruginous hairs. Maximowicz, in his paper on the Eastern Asiatic *Celastraceae*,§ regards these plants as distinct species, and distinguishes them by the number of the stigmatic lobes, and by the shape of the fruit. This classification was adopted by Lösener,‖ although Hemsley¶ states *T. Bullockii*, Hance, is the same as Hooker's plant.

A few years after the publication of *T. Wilfordi* and before *T. Bullockii* became known, E. Regel** gave a figure and a description of *T. Wilfordi*, which was drawn from the specimen sent to Hooker and determined by him.

According to this description, the plant has a 6-lobed stigma and glabrous branchlets. Thus, the number of the stigmatic lobes appears to be inconstant, since Hooker and Regel give a different number in the same species. Recently Matsuda made an attempt to reduce Hance's plant to *T. Wilfordi* as a variety of the latter.††

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* Boiss., l.c.
† Hooker, in Benth. et Hook. Genera Pl., i, p. 368.
‡ Hance, in Journ. Bot., 1880, p. 259.
§ Maxim., in Mél. Biol , xi, p. 206 (1881).
‖ Lösener, in Engl. u. Pr. Pflanzenfam., iii, 5, p. 213 (1892).
¶ Hemsley, in Index Fl. Sinensis, i, p. 125 (1886).
** Regel, Gartenfl , 1869, p. 105 t. 612.
†† Matsuda, in Tôkyô Bot. Mag., xxiv, p. 286 (1910).

As a result of my investigation at Kew and the British Museum, I have been led to the conclusion that our previous conception of the genus *Tripterygium* requires alteration. Two kinds of flower occur in this genus, as in some other members of this family: one is hermaphrodite and the other male with unfertilized ovules. The male flower assumes the same appearance as the hermaphrodite, with the difference that the stigma is imperfectly lobed, and incapable of receiving pollen grains. Hooker's description of the stigma was probably based on the male flower, in which the style is slightly shorter than in the other, clavate in shape, and the stigma is more or less slightly 3-lobed. The diagnosis of the stigma in this genus must therefore be emended to read "6-lobed in the normal flower."

As to whether *T. Bullockii* should be regarded as a distinct species, or is merely a variety, or identical with *T. Wilfordi*, I entirely agree with Hemsley that these two plants are the same, and that *T. Bullockii* is not even a variety.

One important thing to be mentioned here is the difference between the specimens of *T. Wilfordi* from Formosa and those from Japan. The former is the plant described by Hooker and also by Hance, and the latter by Regel; it is distributed in Corea as well. The difference was also noticed by Matsuda, but unfortunately he used entirely wrong names. The Japanese form appears very similar to the Formosan at first glance, but differs in characters of indumentum, texture and crenation of the leaf, more floriferous inflorescence, and in the shape of the fruit.

A new arrangement of the species and forms of this genus is given below.

Tripterygium Wilfordi, *Hook. f.* in Benth. et Hook. Gen. Pl. i, p. 368.—Hemsl. Ind. Fl. Sin. i, p. 125, excl. spec. e Corea; *T. Bullockii*, Hance, in Journ. Bot. 1880, p. 259.—Maxim. in Mél. Biol. xi, p. 206; *T. Wilfordi* var. *Bullockii*, Matsuda, in Tôkyô Bot. Mag. xxiv, p. 286.

Folia subcoriacea, longe et saepe caudato-acuminata, margine crenata, utrinque 5- vel 6-costata. *Rami* castaneo-brunnei, verrucosi, ferrugineo-hirtelli, ramulis ferrugineo-tomentosis. *Fructus* alis basi plerumque truncatis vel leviter cordatis, apice subtruncatis vel leviter emarginatis, margine integris.

Formosa. On banks of the River Sanar, *C. Wilford*; Tamsui, Oldham, 1864; Kelung, *C. Ford*, 1884; *Faurie*, 75.

China. Great Black Mt. 5–7000 ft., *Hancock*, 284; N.W. Yunnan, *G. Forrest*, 808; "in collibus demissis secus fl. Liang, reg. septentr. provinciae Hunan," *Bullock*, 1878, hb. Hance, 20,692.

Var. **exesum**, *Sprague* et *Takeda*.

Differt a typo foliis utrinque 6–9-costatis, fructibus paulo majoribus, maturis purpureo-rubris, alis basi cordatis apice profunde et aperte emarginatis.

China. Yunnan: Mengze, N. Mts., 1520 m., *A. Henry*, 10,203.

This variety is very peculiar in the shape of the fruit, which is deeply cut at the apex. The colour of the fruit corresponds to the Chinese description given in *Chi wu ming shi t'u k'ao*, vol. xxxvi, fol. 15. This variety may perhaps be a distinct species, but owing to the lack of ample material, we hesitate to raise it to the rank of species.

Tripterygium Regelii, *Sprague* et *Takeda*, sp. nov.; *T. Wilfordi*, Regel, in Gartenfl. 1869, p. 105, tab. 612; *T. Wilfordi*, Maxim. l.c. —Matsuda, l.c.

A specie praecedente differt praesertim foliis majoribus chartaceis acutis vel acuminatis utrinque 6–9-costatis margine grosse crenatis; ramis minus verrucosis, glabris vel pilosis, ramulis glabrescentibus vel albido-hirtellis; inflorescentia floribunda; fructibus majoribus, alis basi profunde cordatis apice emarginatis margine irregulariter sinuatis.

JAPAN. Kujûsan (errore Kunjôsan appell.), prov. Kyûshû, *Maximowicz*, 1863; Hondôji, prov. Uzen, *R. Yatabe*, 1887; Mt. Chokai, prov. Ugo, *M. Komai*, 1906.

COREA. Seoul, *Carles*, 1884; "fluvium Jalu super., districtus Samsu circa Sangsu-u," *V. Komarov*, 1897.

XXV.—SAPIUM CLADOGYNE, A NEW SPECIES FROM BRITISH GUIANA.

J. HUTCHINSON.

In December, 1910, a series of specimens of *Sapium* collected by Mr. F. A. Stockdale, Assistant Director of Agriculture, and others in British Guiana were communicated to Kew by Prof. J. B. Harrison, Director of Agriculture, for comparison with the type of *S. Jenmani*, Hemsl.

A careful examination proved that two species were represented, which, although apparently identical in their vegetative parts, could be distinguished by a remarkable and interesting difference in the form of the inflorescence. Mr. Stockdale calls attention to this difference in a paper on the Indigenous Rubber Trees of British Guiana, published in Timehri: The Journal of the Royal Agricultural and Commercial Society of British Guiana, January, 1911, p. 24.

In *S. Jenmani* as shown by Hemsley's figure in Hook. Ic. Pl. t. 2649, which we regard as representing the type of the species, the inflorescence is unbranched and the female flowers are disposed for some distance along the lower part of the rhachis, the upper part being male. The flowers of both sexes are evidently mature about the same time, or they are perhaps slightly protogynous. In *S. cladogyne*, the name proposed for the new species, however, as pointed out by Mr. Stockdale, the inflorescence consists of a central spike with two very short lateral branches at the base which bear the female flowers. During the flowering stage of the male these female branches are detected only by close examination. The female flowers evidently attain maturity a considerable time after the fall of the male, the axis bearing the latter soon articulating at the base and leaving a large scar which can be plainly seen in the young and also in the mature fruiting stages.

It appears to the writer that this difference in the time of flowering of the two sexes constitutes another important character serving to separate the species, for in *S. Jenmani* it is highly probable that pollination is affected by male flowers from the same individual, whereas in *S. cladogyne* this is obviously not possible. Field notes on this point would be of interest.

In a communication received by the writer in October, 1911, Mr. Stockdale states that since his paper was published in the Journal quoted above it has come to his notice that the latex produced by plants of the new species (*S. cladogyne*) is somewhat different from that obtained from *S. Jenmani*, but that complete analyses had not then been made. He adds the important fact that the growth of young trees of the two species under cultivation is decidedly different, the primary branches of *S. Jenmani* being directed upwards and forming an acute angle with the stem, whilst in the new species (*S. cladogyne*), the branches spread almost horizontally. He further states that the colour of the leaves is darker in the latter species.

Sapium cladogyne, *Hutchinson*, sp. nov.; affinis *S. Jenmani*, Hemsl., spicis ♂ terminalibus post anthesin deciduis, spicis ♀ 2 suboppositis sub maris anthesi vix evolutis ad basin rhachis maris sitis differt.

Arbor 6–7 m. alta; ramuli juniores glabri. *Folia* sparsa, oblonga vel oblongo-elliptica, obtuse caudato-acuminata, basi plerumque cuneata, 4–12 cm. longa, 2–4·5 cm. lata, integra vel remotissime glanduloso-denticulata, chartacea, crebre minuteque pellucido-punctata, nervis primariis lateralibus utrinque 8–10 arcuatis prominentibus; petioli 1–2·5 cm. longi, apice glandulis lateralibus sessilibus parvis instructi. *Inflorescentiae* bisexuales, ramulis lateralibus brevibus terminatae. *Spicae* ♂ terminales, graciles, ad 12 cm. longae, post anthesin deciduae; spicae ♀ 2, suboppositae, sub maris anthesi vix evolutae, ad basin rhachis sitae. *Flores* ♂ 8–9 aggregati, glandulis geminatis peltatis suffulti; bracteae semiorbiculares; bracteolae setulosae. *Calyx* bipartitus, glaber; segmenta suborbicularia. *Stamina* 2; filamenta 1 mm. longa, crassa, glabra; antherae 0·75 mm. latae. *Flores* ♀ non visi. *Infructescentiae* geminatae, pedunculatae, 4–7 cm. longae; rhachis leviter flexuosa, glabra. *Capsulae* crustaceae, 1-loculares, 1 spermae, subglobosae, circiter 0·7 cm. diametro, 2-valves. *Semina* subglobosa, paullo compressa, 0·5 cm. diametro, extus pulposa. *S. Jenmani*, Hemsl. in Hook. Ic. Pl. sub. t. 2649, as to Jenman, 7505; Pax in Engler, Pflanzenr. Euphorb.-Hippomaneae, p. 217, partly.

British Guiana. Head of Pomeroon River, *Jenman*, 7505! Arriah Trib; Upper Pomeroon River, *Beckett*, 8628! Fort Island; Essequibo River, *Beckett*, 8767! 8768! *Stockdale*, 8766! Cultivated in the Botanic Gardens, Georgetown, *Foote!* *Bartlett*, 8724! *Stockdale*, 8765! *Greeves*, 8766!

XXVI.—DIAGNOSES AFRICANAE, XLVIII.

1341. **Alsodeiopsis Chippii**, *Hutchinson* [Olacaceae-Icacineae]; affinis *A. Rowlandii*, Engl., sed ramulis junioribus dense strigoso-pilosis, foliis supra longe setosis, petiolis brevioribus, inflorescentiis paucifloris differt.

Frutex; ramuli juniores graciles, dense strigoso-pilosi. Folia oblongo-elliptica vel leviter oblongo-oblanceolata, acutissime acuminata, basi inaequaliter rotundata, 7–13 cm. longa, 3–5 cm. lata,

integra, membranacea, supra longe setosa, subtus pilosa, nervis lateralibus utrinque 8–10 paullo arcuatim ascendentibus supra distinctis subtus prominentibus, nervis tertiariis subparallelis ; petioli 3–4 mm. longi, strigoso-pilosi. *Inflorescentia* brevis, pauciflora, brevissime pedunculata, pedunculo 0·5 cm. longo piloso ; pedicelli 5–7 mm. longi, graciles, pubescentes. *Sepala* subulata, 1·5 mm. longa, extus pubescentia. *Petala* libera, flava, lanceolata, subobtusa, 4 mm. longa, 1·25 mm. lata, extus parce pubescentia, intus glabra. *Stamina* quam petala breviora ; antherae 0·75 mm. longae. *Ovarium* subcylindricum, adpresse pilosum, in stylum glabrum gracilem petala vix aequantem attenuatum. *Fructus* ignoti.

Tropical Africa. Gold Coast : Axim district ; near Dompem (Atissiabo), *Chipp*, 46.

1342. **Buchenroedera glabrescens**, *Dümmer* [Leguminosae-Genisteae] ; *B. vimineae*, Presl, affinis sed habitu graciliore undique glabrescens, foliolis brevioribus anguste lanceolatis, racemis laxis distat.

Herba perennis, ubique floribus exceptis glabrescens ; caules annui florentes pauci vel conferti, fere stricti, graciles, subteretes, ad 30 cm. alti, dense foliosi. *Folia* ascendentia, trifoliolata, exstipulata ; petioli teretiusculi, circiter 2 mm. longi ; foliola saepe conduplicata, anguste subfalcato-lanceolata, acuta, petiolis triplo aut quadruplo longiora, dorso costata, subcoriacea. *Racemi* terminales ad 3·5 cm. alti, 8–15 flori, floribus perbreviter pedicellatis ; bractea subulato-lanceolata calycis tubum fere aequans aut eo brevior. *Calyx* 3·5 mm. longus, parce sericeus mox glaber, dentibus obtuse deltoideis tubo triplo brevioribus. *Vexilli* limbus fere orbiculatus, incrassatus, 4 mm. diametro, extus parce sericeus, ungui sulcato fere aequilongus ; alae graciliter unguiculatae, circiter 5 mm. longae, limbis oblique navicularibus obtusis basi auriculis ornatis ; carina alis similis nisi lamina angustiore. *Ovarium* sericeum, 8–10 ovulatum, stylo arcuato glabro ovario saltem duplo longiore.

South Africa. Eastern Region : Natal ; without precise locality, *Gerrard*, 1090.

Few of the Buchenroederas exhibit a glabrescent habit, this species and *B. pauciflora*, Schlechter, being exceptions ; the species under consideration exhibits an affinity to *B. viminea*, Presl, but the character alluded to, the plant's slender habit, shorter lanceolate leaflets and more laxly flowering racemes render the species easy of identification.

1343. **Buchenroedera Macowanii**, *Dümmer* [Leguminosae-Genisteae] ; *B. multiflora*, Eckl. et Zeyh., habitu magis divaricato-ramoso, foliolis brevioribus obovato-cuneatis, capitulis 2–3 floris, floribus minoribus distinguenda.

Fruticulus divaricato-ramossisimus, superne dense foliatus, ad 20 cm. altus, primo argenteo demum fulvido-sericeus, ramulis ultimis circiter 3·5 cm. longis. *Folia* trifoliolata ; petioli 1 mm. longitudinis vix excedens ; foliola saepissime conduplicata, obvato-cuneata, reflexo-mucronata, inter se aequilonga vel terminalia paulo longiora, 2–3 mm. longa, utrinque creberrime sericea, mox supra glabrescentia, coriacea ; stipulae binae mox deciduae, petiolos paullo superantes, falcato-subulatae, apice valde deflexae.

Inflorescentia terminalis, sessilis, umbellatim 2–3-flora, floribus perbreviter pedicellatis bracteolis subulatis parvulis munitis. *Calyx* 4 mm. longus, extra fulvido-hirsutulus, dentibus deltoideis tubo triente brevioribus. *Vexillum* breviter unguiculatum toto 6 mm. altum, limbo suborbiculari postice fulvo-sericeo (sicco pallide lilacino margine albido); alae graciliter unguiculatae, glabrae, limbis oblongis rotundatis basi truncatis unguibus aequilongis; carina alis paulo brevior, lamina naviculari 3–3·5 mm. longa, acutata basi auriculis parvulis ornata, extra sericea. *Ovarium* 2 mm. longum, valde fulvo-hirtellum, stylo ovario duplo longiore glabro arcuato; stigma fere simplex.

South Africa. Central Region: Somerset Div.; on Bruintjes Hoogte, 1500 m., *MacOwan*, 1738.

1344. **Buchenroedera uniflora**, *Dümmer* [Leguminosae-Genisteae]; *B. Macowanii*, Dümmer, similis, nisi habitu magis prostrato, indumento crassiore villosulo-tomentosa, floribus plerumque solitariis, leguminibus calyces valde excedentibus.

Suffrutex adpresse prostratus, conferte divaricato-ramossisimus, dense foliatus, primo undique praeter flores fulvido-villosulo-tomentosus. *Folia* trifoliolata; petioli 1 mm. longi aut longiores, foliola petiolis duplo vel triplo longiora, saepissime conduplicata, anguste cuneata, acutata, inter se subaequilonga, incrassata; stipula unica mox decidua, foliolis similis. *Flores* axillares, solitarii (raro bini), breviter pedicellati. *Calyx* circiter 4 mm. longus, extra hirtellus, dentibus deltoideis acutis tubo duplo brevioribus. *Corolla* glaberrima; vexillum unguiculatum, spatulatum, acutum, basi fere truncatum, toto 5 mm. longum; alae leviter curvatae, obtusae, basi truncatae, omnino 5–6 mm. longae; carina alis similis sed latior unguibus gracilibus limbo fere aequilongis. *Legumen* turgido-compressiusculum, rectum, oblongum, ad 10 mm. longum, 3 mm. latum, hirtellum, 6–10 spermum.

South Africa. Central Region: Graaff Reinet Div.; on the summit of Mount Koudveld, Sneeuwberg Range, 1500 m. *Bolus*, 2580.

The relatively long legume distinguishes this species from any of its nearer allies and is eminently suggestive of *Lotononis*, but the short, almost equally 5-toothed calyx emphasises its approximation to this genus.

1345. **Melolobium decorum**, *Dümmer* [Leguminosae-Genisteae]; *M. candicanti*, Eckl. et Zeyh., peraffinis sed habitu robustiore, foliolis majoribus, floribus plurimis majoribus, bracteis majusculis calyces fere aequantibus recedit.

Frutex divaricato-ramossisimus, spinosus ad 40 cm. altus, primo puberulo-viscidulus, demum glabrescens, spinis gracilibus nudis aut 3–6-floris luteis ad 4 cm. longis. *Folia* trifoliolata; petioli ad 3 mm. longi; foliola obovato-cuneata, vix mucronulata vel rotundata, inter se fere aequilonga vel lateralia paullo breviora ad 8 mm. longa, 2·5 mm. lata, dorso costata, coriacea mox glabrescentia, pallide viridescentia; stipulae binae, arrectae, petiolos subaequantes vel superantes dimidiatim ovatae vel ovato-lanceolatae, cordatae, acutae. *Flores* flavidi, pedicellis circiter 1 mm. longis; bractea stipulis similis; bracteolae singulae aut binae, lanceolatae, acuminatae, foliosae, calycem fere aequantes. *Calyx* extus pubescens,

7–8 mm. longus. *Corolla* glabra ; vexillum unguiculatum, 10 mm. altum, limbo fere orbiculato in unguem subaequilongum sensim attenuato ; alae 8 mm. longae, limbis inferne conduplicatis oblongiusculis obtusis basi truncatis ; carina alis fere aequilonga, graciliter unguiculata, limbo anguste naviculari auriculato. *Ovarium* pubescens, stylo graciliter arcuato glabro.

South Africa. Central Region : Graaff Reinet Div. ; on the slopes of mountains near Graaff Reinet, 1140 m. *Bolus*, 483.

An exceedingly handsome and floriferous species, worthy of cultural attention, most closely allied to *M. candicans*, Ecklon & Zeyher, but distinguished by the more robust, floriferous habit, larger leaves, flowers and bracteoles.

1346. **Melolobium glanduliferum**, *Dümmer* [Leguminosae-Genisteae] ; species *M. decumbenti*, Benth., persimile, sed spinis longioribus vix furcatis, foliis majoribus et cum calyce stipitate glandulosis, floribus paullulo minoribus, vexilli lamina ovato-orbiculari differt.

Suffrutex decumbens, caulibus ad 30 cm. longis pubescenti-hispidulis, ramulis lateralibus saepe confertis brevibus in spinas 2–3-floras luteas glabrescentes extensis ; spinae plerumque simplices, ad 2·5 cm. longae. *Folia* trifoliolata, pubescentia, stipitate glandulosa ; petioli 1–3 mm. longi, foliola oblanceolata-cuneata, rotundata aut acutata, inter se subaequalia, ad 5 mm. longa, vix coriacea, pallide viridia ; stipulae binae, arrectae, semicordato-lanceolatae, acutae, petiolos subaequantes. *Flores* perbreviter pedicellati, ad spinas inferne dispositi, flavidi ? ; bractea stipulis similis ; bracteola lanceolata, acuta, calycis tubum fere aequans. *Calyx* extra pubescens, glandulosus, 6 m. longus. *Corolla* glabra ; vexillum unguiculatum, 8 mm. altum, lamina ovato-orbiculata ungui fere aequilonga ; alae graciliter unguiculatae, vexillo aequilongae, oblongiusculae, obtusae, basi fere truncatae ; carina alis similis, nisi minor et basi sagittata. *Ovarium* paulo hirsutulum, stylo arcuato glabro aequilongum.

South Africa. Kalahari Region : Basutoland ; without precise locality, *Cooper*, 703.

A species having the xerophytic spinescent habit of *M. decumbens*, Bentham, but differing in its glandulosity, relatively larger leaflets and smaller flowers. Specimens gathered by Mr. A. Haagner at Brandfort in the Orange River Colony (ex *Herb. Conrath* and *Kew*, 1189) may belong here, but lack of flowers renders this point undecisive.

1347. **Melolobium macrocalyx**, *Dümmer* [Leguminosae-Genisteae] ; *M. cernuo*, Eckl. et Zeyh., affinis sed habitu magis distiche ramoso parce folioso, indumento canescente, foliolis brevioribus, floribus arrectis haud nutantibus, calyce corollam fere superante differt.

Fruticulus inermis, gracilis, laxe distiche ramosus, parce foliosus ad 40 cm. altus ubique corollis exceptis canescens, ramis lateralibus adscendentibus teretibus ad 8 cm. longis. *Folia* trifoliolata, magis minusve arrecta ; petioli ad 2 mm. longi ; foliola lineari-oblanceolata, acutata, carnosula, supra canaliculata, subtus convexa, terminalia ad 7 mm. longa, lateralia paullo aut duplo breviora ; stipulae binae, arrectae, oblique lanceolato-ovatae, acutatae, basi paullulo auriculatae, ad 4 mm. altae, intra glabrescentes. *Spicae* plurimae ad 5 cm. altae, 4–7 florae, floribus arrectis flavidis ? ; bractea stipulis similis nisi

major, calycis tubum aequans ; bracteolae ad calycis basem, binae, lanceolatae, acutae. *Calyx* 6–7 mm. longus, segmentis binis superioribus deltoideis tubo aequilongis, dentibus ternis infimis 1–1·5 mm. longis. *Corolla* in calyce fere inclusa, glabra ; vexillum spatulatum, lamina concava obovata in unguem brevem attenuata ; alae unguiculatae, 6 mm. longae, limbis apicem versus angustatis basi vix auriculatis; carina alis similis nisi latior, apice magis rotundata. *Legumen* immaturum ? complanatum, oblongum, rectum, 10 mm. longum, canescens, 2-spermum. *M. cernuum*, Benth. in Hook. Lond. Jour. Bott. iii, 1844, 362 (in part).

South Africa. Kalahari Region : Griqualand West ; between Klip Fontein and Knegt's Fontein, *Burchell*, 2169. Bechuanaland; plains south of Takun (between Pintado Fountain and Thermometer Fountain), *Burchell*, 2224.

German South-West Africa. Hereroland, Okahandya, 1300 m., *Dinter*.

Var. **longifolia**, *Dümmer*, typo similis nisi foliis longioribus.

Petioli ad 7 mm. longi ; foliola saepe conduplicata, linearioblonga, obtusiuscula, terminalia ad 20 mm. longa, lateralia paullo breviora, supra glabrescentia, subtus pubescentia, margine incrassata.

South Africa. Central Region : Carnavon Div. ; at Buffel's Bout, *Burchell*, 1610.

A species distantly related to *M. cernuum*, Eckl. and Zeyh., but differing principally in the more robust canescent habit, the flowers, which are appressed to the axis and the large calyces. Burchell's specimens were referred by Bentham to the former species, but the characters cited, in conjunction with the more north-central distribution of the species here described, does not support this identification.

1348. **Melolobium mixtum**, *Dümmer* [Leguminosae-Genisteae] ; *M. glandulifero*, Dümmer, affine, sed magis divaricato-ramosa, petiolis foliola aequantibus aut superantibus, floribus minoribus, calycis labio inferiore superius valde superante recedit.

Suffrutex xerophyticus, divaricato-spinescenti-ramosus, prostratus vel decumbens, undique corollis exceptis valde patentim pubescens et stipitatim glandulosus ; spinae ultimae 1–4-florae plerumque simplices, ad 4 cm. longae. *Folia* trifoliolata ; petioli foliola aequantes aut superantes ; foliola saepius conduplicata, oblanceolato-cuneata vel lanceolata, acutata vel obtusa, inter se subaequilonga, ad 6 mm. longa, 2 mm. lata, dorso prominenter costata, laete viridia ; stipulae binae, arrectae, foliosae, semicordato-lanceolatae vel cordatae, obtusae vel acutae, ad 4 mm. longae. *Flores* perbreviter pedicellati, flavidi, bracteis stipulis similibus nisi angustioribus, bracteolis lanceolatis calycis tubum vix aequantibus. *Calyx* 5–6 mm. longus, labio inferiore 3-dentato superius valde superante. *Corolla* glabra ; vexilli lamina fere orbicularis, emarginata inferne paullulo auriculata, 4 mm. alta, ungui fere duplo longior ; alae curvatae, toto 6 mm. longae, limbis late oblongiusculis rotundatis auriculatis ; carinae limbus oblique breviter navicularis, rotundatus, basi auriculis ornatus. *Stylus* arcuatus, glaber, ovario aequilongus. *Legumen* vix falcatum, oblongum, subtorulosum, compressiusculum, circiter 1 cm. longum, 4 mm. latum, pubescens, glandulosumque, 3-spermum.

South Africa. Coast Region: Queenstown Div., *Cooper*, 217. Central Region: Somerset Div.; Somerset East, *Zeyher*, 105; Bosch Berg, 1200 m. *Mac Owan*, 610. Albert Div., *Cooper*, 1393. Kalahari Region: Orange River Colony; Caledon River, *Burke*, *Zeyher*, 391; Bloemfontein, *Rehmann*, 3816; Harrismith, *Wood*, 4789. Eastern Region: Transkei; Tsomo, *Baur*, 475. Natal Coldstream, *Rehmann*, 6902.

Burke and Zeyher's specimens were associated by Bentham with his *M. decumbens*, but an inspection shews the erroneity of this procedure, and their closer relationship to *M. glanduliferum*, Dümmer, from which they principally differ in their more divaricately branched, less spinous habit, the equally long petioles and stipules, smaller flowers, and the upper 2-lobed lip of the calyx exceeding the lower 3-toothed lip. Superficially, the species under consideration resembles *M. microphylla*, Ecklon and Zeyher and *M. Burchellii*, N. E. Brown, but the short spreading pubescense distinguish it from the former, while the conspicuous glandulosity and scarcely acute leaflets differentiate it from the latter species immediately.

1349. **Melolobium Pegleri**, *Dümmer* [Leguminosae-Genisteae]; a *M. alpino* Ecklon et Zeyher, foliolis majoribus, stipulis petiolos plerumque subaequantibus, bracteis anguste ovatis distinguitur.

Frutex ad 5 dm. altus, ramis subfastigiatis perpaucis? ascendenitibus simplicibus graciusculis pubescenti-hispidulis foliatis. *Folia* trifoliolata; petioli graciles, ad 5 mm. longi; foliola oblanceolato-cuneata, mucronata aut emarginata, dorso costa prominente, parce puberula, supra mox glabra, subcoriacea, terminalia ad 20 mm. longa, 4 mm. lata, lateralia terminalibus subaequalia vel iis breviora; stipulae binae, arrectae, semicordato-lanceolatae, acutae plerumque petiolos fere aequantes. *Racemi* terminales, recti, 6–14-flori, floribus perbreviter pedicellatis; bractea anguste-ovata, acuta, 2–3 mm. longa; bracteolae binae, subulatae, minutae. *Calyx* extus viscidulo-pubescens, circiter 7 mm. longus. *Corolla* glabra; vexillum 8 mm. altum, lamina ovato-orbiculari emarginata ungui fere aequilonga; alae 8–9 mm. longae, limbis late oblongis rotundatis obtuse subsagittatis; ungues 3 mm. longi; carinae limbus anguste navicularis, rotundatus, basi subsagittatus. *Stylus* crassiusculus, arcuatus, glaber, ovario sericeo brevior. *Legumen* oblongum, subfalcatum, subtorulosum, subcompressiusculum, ad 2 cm. longum, 3–4 spermum, viscidulo-pubescens.

South Africa. Eastern Region: Xalanga District; Cala, hill-side, 1200 m. *Alice Pegler*, 1739.

1350. **Leucadendron Schlechteri**, *Phillips et Hutchinson* in Dyer Fl. Cap. vol. v. sect. 1, p. 521, anglice [Proteaceae-Proteeae]; affinis *L. Schinziano*, Schlechter, bracteis ♂ breviter pubescentibus vel tomentellis, ♀ villoso-tomentosis, inflorescentiis ♂ et ♀ dissimilibus differt.

Rami teretes, dense appresse pubescentes; ramuli juniores appresse albo-tomentosi. *Folia* lineari-lanceolata vel oblanceolata, inferiora 1·2–2 cm. longa, 2·5–4 mm. lata, superiora majora, 3–5 cm. longa, 5–6 mm. lata, omnia apice mucronata, rigide coriacea, utrinque dense appresse tomentosa. *Inflorescentia* ♂ solitaria, terminalia, depresso-globosa, vix 1·5 cm. diametro; bracteae

lanceolatae, acutae, 2 mm. longae, villosae. *Perianthii* tubus 3·25 mm. longus, dense pilosus ; segmenta 2·5 mm. longa, breviter villosa ; limbus lanceolato-ellipticus, subacutus, 1·5 mm. longus, extus villosus. *Antherae* lineares, 1·25 mm. longae. Stylus filiformis ; stigma clavatum, subacutum, 1·25 mm. longum. *Inflorescentia* ♀ terminalis, depresso-globosa, 2–3 cm. diametro ; bracteae obovatae, 8–10 mm. longae, 4–5 mm. latae, exteriores abrupte acutae, extus dense villosae, intus glabrae et longitudinaliter striatae. *Perianthii* segmenta 9 mm. longa, linearia, villosa ; limbus 1 mm. longus, ovatus, subacutus, villosus. *Staminodia* 0·5 mm. longa, oblonga, minute apiculata. *Squamae hypogynae* 1 mm. longae, ovatae, acuminatae. *Stylus* 7 mm. longus, oblique insertus, filiformis, glaber ; stigma bilobum. *Ovarium* 3 mm. longum, glabrum.

South Africa. Cape Colony : Clanwilliam Div. ; Cedarberg Range, at Ezelsbank, *Schlechter*, 8829, 8830.

1351. **Leucadendron radiatum**, *Phillips et Hutchinson* in Dyer Fl. Cap. vol. v., sect. 1, p. 529, *anglice* [Proteaceae-Proteeae] ; species inflorescentiis foliis dense appresse tomentosis numerosis patulis circumdatis distinctum.

Suffrutex robustus, circiter 0·75 m. altus ; rami patuli ; ramuli erecti, robusti, leviter sulcati, longe pilosi. *Folia* oblanceolata, apice obtuse calloso-mucronata, 1·2–2 cm. longa, 3–5 mm. lata, rigide coriacea, utrinque tenuiter pubescentia. *Inflorescentia* ♂ terminalis, subglobosa, circiter 1·3 cm. diametro, foliis appresse tomentosis numerosis involucrata ; bracteae ovato-lanceolatae, obtusae, 1·5 mm. longae, villosae. *Perianthii tubus* 2 mm. longus, villosus ; segmenta spathulato-linearia, 3 mm. longa, pubescentia ; limbus oblongus, obtusus, 1 mm. longus, pubescens. *Antherae* lineares, vix 1 mm. longae. *Stylus* teres, 4 mm. longus, glaber ; stigma clavatum, subacutum, vix 1 mm. longum. *Squamae hypogynae* filiformi-lineares, 1 mm. longae. *Inflorescentia* ♀ solitaria, terminalis, ovoidea, circiter 1·2 cm. longa et diametro ; bracteae transverse oblongae, 2·5 mm. longae, 4·5 mm. latae, tomentosae. *Perianthii* tubus 2·5 mm. longus, pilosus ; segmenta linearia, 1·5 mm. longa, villosa ; limbus oblongus, obtusus, hirsutus. *Squamae hypogynae* lineares, 1 mm. longae. *Ovarium* ellipsoideum, 1 mm. longum, glabrum. *Infructescentia* ellipsoidea, circiter 2·5 cm. longa, 2 cm. diametro ; bracteae circiter 15-seriatae, transverse oblongae, truncatae, circiter 5 mm. longae, 1·2 cm. latae, extus appresse pubescentes, apice fere glabrae. *Fructus* non visi.

South Africa. Cape Colony : Riversdale Div. ; on the summit of Kampsche Berg, *Burchell*, 7110.

1352. **Leucadendron coriaceum**, *Phillips et Hutchinson* in Dyer Fl. Cap. vol. v., sect. 1., p. 531, anglice [Proteaceae-Proteeae] ; affinis *L. lanigero*, Buek, foliis obovatis apice rotundatis 8–14 mm. longis glabris, inflorescentiis ♂ paucibracteatis differt.

Rami teretes, breviter pubescentes vel glabri. *Folia* oblanceolata, vel spathulato-obovata, apice rotundata, obtuse mucronata, 8–14 mm. longa, 4–6·5 mm. lata, rigide vel crasse coriacea, glabra. *Inflorescentia* ♂ solitaria, terminalis, vix 2 cm. diametro, subdepresso-globosa ; bracteae lanceolatae, subobtusae, 2 mm. longae. *Perianthii* tubus 2·5 mm. longus, inferne glaber, superne pilosus ;

segmenta spathulato-linearia, 4 mm. longa, appresse pilosa; limbu oblongus, subacutus, 1·5 mm. longus, pubescens. *Antherae* lineares 1 mm. longae. *Stylus* cylindricus, 5 mm. longus, basi longe pilosus; stigma ellipsoideum, subacutum, 1 mm. longum. *Squamae hypogynae* filiformes, 3 mm. longae. *Inflorescentia* ♀ foliis superioribus cincta; bracteae ovatae, acuminatae, 4 mm. longae, villosae. *Perianthii* segmenta spathulato-linearia, 6·5 mm. longa, superne villosa, inferne glabra; limbus oblongus, obtusus vel subobtusus, 1 mm. longus, villosus. *Staminodia* linearia, vix 1 mm. longa. *Squamae hypogynae* lineares, longe acuminatae, 2·25 mm. longae. *Ovarium* compressum, alatum, 1 mm. longum; stylus linearis, 4·25 mm. longus, glaber, oblique insertus; stigma obliquum.

South Africa. Cape Colony: Bredasdorp Div.; near Elands Kloof, *Mund*, 5; near Kars River, *Ludwig*. Swellendam Div.; mountains near Swellendam, (*Pappe ?*).

1353. **Leucadendron Galpinii**, *Phillips et Hutchinson* in Dyer Fl. Cap., vol. v., p. 535, anglice [Proteaceae-Proteeae]; affinis *L. ramosissimo*, Buek, sed foliis obtusis bracteis ♂ exterioribus tomentosis nec coloratis quam floribus brevioribus differt.

Ramuli ♂ graciles, ♀ robustiores, tenuiter pubescentes, juniores acute angulares, demum teretes. *Folia* ramulorum ♂ quam ramulorum ♀ minora, illa 1·2–2·5 cm. longa, 2–3 mm. lata, haec 2·5–4·5 cm. longa, 2–3·5 mm. lata, omnia lineari-oblanceolata, obtusa, longitudinaliter striata vel rugosa, utrinque glabra. *Inflorescentia* ♂ solitaria, terminalis, globosa, circiter 1 cm. diametro; bracteae lanceolatae, 1·5 mm. longae, dense villosae. *Perianthii* tubus cylindricus, 2 mm. longus, pubescens; lobi 2·5 mm. longi, pubescentes; limbus lanceolatus, subacutus, 1 mm. longus, pubescens. *Antherae* 1·25 mm. longae, lineares. *Stylus* 3 mm. longus, filiformis, inferne pubescens; stigma 0·5 mm. longum, ellipsoideum vel clavatum. *Inflorescentia* ♀ oblongo-ellipsoidea, 2–3 cm. longa, 2–2·5 cm. diametro; bracteae 6 mm. longae, 10 mm. latae, basi villosae, ceterae pubescentes, ciliatae. *Perianthii* segmenta 9 mm. longa, inferne glabra, superne villosa; limbus linearis, 0·5 mm. longus. *Ovarium* 2·5 mm. longum, ellipsoideum, longe pilosum; stylus 5 mm. longus, cylindrico-filiformis, basi parce pilosus; stigma truncatum vel minute bifidum.

South Africa. Cape Colony: Riversdale Div.; Milkwoodfontein, *Galpin*, 4439; without precise locality, *Thom*, 69, 71, 538; *Bowie*.

1354. **Leucadendron Phillipsii**, *Hutchinson* in Dyer, Fl. Cap., vol. v., sect. i., p. 538, *anglice* [Proteaceae-Proteeae]; affinis *L. adscendenti*, R. Br., bracteis ♀ inferne pubescentibus superne glabris differt.

Frutex usque ad 3 m. altus; ramuli adpresse puberuli vel pubescentes. *Folia* linearia, apice subacute callosa, recta vel saepius falcata, 3–4·5 cm. longa, 2–3 mm. lata, rigide coriacea, glabra. *Inflorescentia* ♂ subglobosa, circiter 1 cm. diametro, foliis basi angustatis paucis involucrata. *Bracteae* floriferae oblongae, obtusae, 1 mm. longae, dorso leviter carinatae, basin versus tenuiter pubescentes. *Perianthii* tubus cylindricus, 1 mm. longus, glaber; segmenta spathulato-linearia, 2·5 mm. longa, glabra; limbus anguste oblongus, obtusus, 1·25 mm. longus, glaber. *Antherae* 1 mm. longae. *Stylus* 3·5 mm. longus, gracilis, glaber; stigma clavatum, 1·25 mm.

longum. *Inflorescentia* ♀ oblongo-ellipsoidea, circiter 1·2 cm. longa, bracteis brevibus acuminatis ciliatis involucrata. *Bracteae* floriferae transverse oblongo-ellipticae, circiter 6 mm. longae et 8 mm. latae, coriaceae, medio dense adpresse pubescentes, margine et basi glabra. *Perianthii* tubus glaber; segmenta linearia, glabra. *Staminodia* parva. *Ovarium* compressum, suborbiculare, leviter emarginatum, alatum, 2·5 mm. diametro, glabrum; stylus 3 mm. longus, glaber; stigma clavatum. *Infructescentia* circiter 2·5 cm. longa, foliis plus minusve coloratis involucrata. *Fructus* compressi, alati, suborbiculares, leviter emarginati, 5 mm. diametro, glabri.

South Africa. Caledon Div.; Houw Hoek Mountains, *Zeyher*, 3648, partly. Knysna Div.; Paarde Berg, *Burchell*, 5192. Uniondale Div.; near Avontuur, *Bolus*, 2448. Without precise locality, *Drège*, *Harvey*, *Bowie*.

Named in compliment to Mr. E. P. Phillips, M.A., of the South African Museum, Cape Town, with whom the writer collaborated in monographing the genus *Leucadendron* for the Flora Capensis.

1355. **Leucadendron minus,** *Phillips et Hutchinson* in Dyer, Fl. Cap., vol. v., sect. 1, p. 541, *anglice* [Proteaceae-Proteeae]; affinis *L. lanigero*, Buck, sed foliis margine dense pubescentibus, inflorescentiis ♂ distincte involucratis, bracteis ♀ glabris differt.

Frutex circiter 1·25 m. altus; rami ascendentes; ramuli juniores teretes, dense villosi, foliis dense imbricatis fere occulti. *Folia* subaequalia, superiora inflorescentias circumdantes demum bracteiformia, oblongo-linearia vel leviter lineari-oblanceolata, acuta vel subacuta, 2·5–4·5 cm. longa, 3–6 mm. lata, coriacea, longitudinaliter rugosa vel striata, dense ciliata, tenuiter pubescentia. *Inflorescentia* ♂ foliis bracteiformibus occulta, circiter 8 mm. diametro, subglobosa. *Bracteae* floriferae oblongae, apice rotundatae, 3 mm. longae, ciliatae. *Perianthii* tubus 1·5 mm. longus, subcompressus, glaber; segmenta 2 mm. longa, spathulato-linearia, glabra; limbus 1 mm. longus, linearis, obtusus vel subobtusus. *Antherae* 1·5 mm. longae, lineares. *Stylus* 3 mm. longus, filiformis, glaber; stigma clavatum. *Squamae hypogynae* filiformes, 1 mm. longae. *Inflorescentia* ♀ oblongo-ellipsoidea, 2 cm. longa, 1 cm. diametro. *Bracteae* transverse lineari-oblongae, 3 mm. longae, 8 mm. latae, glabrae. *Perianthii* segmenta linearia, 4 mm. longa, glabra; limbus ovatus, subobtusus, 0·5 mm. longus. *Staminodia* linearia. *Ovarium* oblongum, compressum, 1 mm. longum; stylus 2·5 mm. longus; stigma truncatum.—*L. decorum*, var. *minus*, Buek in Drège, Zwei Pfl. Documente, 116, 198. *L. pubescens*, Meisn. in DC. Prodr, xiv. 226, as to preceding synonym, not of R. Br.

South Africa. Caledon Div.; tops of the mountains of Baviaans Kloof near Genadendal, *Burchell*, 7676. Genadendal, *Drège*.

Var. **glabrescens,** *Phillips et Hutchinson*, l.c. 542; ramuli breviter adpresse pubescentes; folia margine breviter pubescente excepto glabra vel fere glabra.

South Africa. Caledon Div.: Donker Hoek Mountain, *Burchell*, 8006.

1356. **Loranthus (Erectilobi) igneus,** *Sprague* [Loranthaceae]; affinis *L. dichroo*, Engl., a quo ramulis verruculosis, foliis basi

rotundatis vel obtusis, toro breviore, calyce distincte lobato recedit.

Ramuli dense verruculosi, novelli pilis ramosis ferrugineis facillime detergibilibus induti, 3–3·5 mm. diametro 30 cm. infra apicem; internodia 1–5 cm. longa. *Folia* opposita vel subopposita, ovato-lanceolata, 6–7 cm. longa, 2·2–3·3 cm. lata, apice subacuta, basi rotundata vel obtusa, tenuiter coriacea, glabriuscula; nervi laterales utrinque 4–5, satis obliqui, procul a margine anastomosantes, supra prominuli, subtus inconspicui; costa supra inconspicua, subtus prominens; petioli 8–10 mm. longi. *Flores* congesti (teste *Braun*). *Torus* calycecum campanulatus 1·4–1·5 mm. longus dentibus exclusis, pilis ferrugineis facile detergibilibus indutus praesertim superne. *Calycis dentes* triangulares, 0·25–0·5 mm. longi. *Corolla* in toto 3·5 cm. longa, ignea (teste *Braun*), extra pilis ferrugineis detergibilibus parce induta; tubus circiter 1·3 cm. unilateraliter fissus, ampulla basali subglobosa 3 mm. diametro; lobi erecti, lanceolato-spathulati, 6·5–7 mm. longi, parte superiore ampliata lanceolata acuta 3·5 mm. longa 0·8–0·9 mm. lata intus strato duro basi abrupte terminato extra versus basin leviter carinata. *Filamenta* inflexa vel involuta, sursum sensim angustata, 4–4·5 mm. longa, basi extrorsum curvata, superne 0·5 mm. incrassata, dente ventrali anguste triangulari acuto 0·3 mm. longo; antherae oblongo-lineares, 1·6 mm. longae, 0·3 mm. latae. *Discus* crassissimus, 0·5 mm. altus, dentibus parvis acutis. *Stylus* superne metuliformis, parte incrassata 3·5 mm longa, collo 1·7 mm. longo; stigma ovoideum vel ellipsoideum, 0·6–0·7 mm. longum.

Tropical Africa. German East Africa: Cheminda-Bakary Rondo, *Braun in herb. Amani*, 1169 (Herb. Berol.).

1357. **Loranthus (Cupulati) pachycladus**, *Sprague* [Loranthaceae]; affinis *L. angulifloro*, Engl., a quo foliis crasse coriaceis, petiolis brevioribus, bractea bifida, toro calycecum majore recedit.

Frutex dumalis, 1·5 m. diametro. *Rami* annotini validi, nodosi, cinnameo-brunnei, 6–9 mm. diametro, cortice rimis irregularibus longitudinalibus; ramuli hornotini striati, glabri, exsiccando brunneo-virides, internodiis 1–5 cm. longis compressis 3–4 mm. latis. *Folia* opposita, elliptica vel late ovata, apice rotundata vel obtusissima, basi rotundata vel subcuneata (inferiora ramulorum obovata, e basi plurinervia), 4·5–7 cm. longa, 3–5 cm. lata, crasse coriacea, glabra, exsiccando opaca, rugosula, supra costa et nervis lateralibus prominentibus, subtus costa infra medium prominente nervis lateralibus saepius inconspicuis, venulis utrinque occultis; nervi laterales pinnatim dispositi (in foliis inferioribus tantum palmatim ortae); petioli 5–8 mm. longi, crassi. *Umbellae* in ramis senioribus fasciculatae, 4–5-florae. *Pedunculus* crassus, 5–8 mm. longus, superne ampliatus, depresso-pyramidalis, breviter ultra cavos pedicellorum productus, apice et intra cavos furfuraceo-pilosus, ceterum glaber; pedicelli 4–6 mm. longi, glabri; bractea 3–3·5 mm. longa, margine dorsali suberecto oblongo valde concavo conspicue bifido 3–3·5 mm. longo, margine ventrali patelliformi. *Torus* calycecum breviter campanulatus, medio leviter constrictus, 3–3·5 mm. longus. *Calyx* 1·75–2 mm. longus, vix dentatus. *Corolla* (in alabastro tantum visa) 3·5 cm. longa, quinquangula, parte apicali ampliata 4·5 mm. longa; tubus versus basin ampliatus. *Filamenta* 13–14 mm. longa; antherae

cuneatae, 3 mm. longae. *Discus* 0·7 mm. altus. *Stylus* collo 3 mm. longo ; stigma peltatum, 3 mm. diametro.—*L. anguliflorus*, Engl. in Engl. Jahrb., vol. xxx. 1901, p. 301, non antea.

Tropical Africa. German East Africa : Ussangu ; Northern Kinga Mountains, on the slopes of Mt. Tyuni, *Goetze*, 1003 (Herb. Berol.).

1358. **Maesobotrya oblonga**, *Hutchinson* in Dyer, Fl. Trop. Afr. vol. vi., sect. 1, p. 668, *anglice* [Euphorbiaceae-Phyllantheae] ; affinis *M. bipindensi*, Pax, foliis oblongis et ovario parce setuloso differt.

Ramuli juniores parce hirsuti, teretes. *Folia* oblonga, apice acute triangulari-acuminata, basi rotundata vel subcuneata, 6·5–14 cm. longa, 2·5–4·5 cm. lata, rigide membranacea, integra, utrinque glabra, nervis lateralibus utrinque 8–10 intra marginem anastomosantibus subtus prominentibus, nervis tertiariis laxis ; petioli 4–8 mm. longi, parce hirsuti ; stipulae lanceolato-subulatae, circiter 2 mm. longae, mox deciduae. *Flores* ♂ non visi. *Racemi* ♀ solitarii, in ramulis foliosis axillares, 9–13 cm. longi ; axis dense puberulus ; bracteae lineares, pubescentes, 1 mm. longae ; pedicelli vix 2 mm. longi, puberuli. *Calycis* lobi 3 vel 4, ovati, apice rotundati, ciliati, parce pubescentes. *Discus* annularis, dense ciliatus. *Ovarium* oblique ovoideum, parce setulosum vel fere glabrum ; styli 3, brevissimi, alte bifidi, glabri.

Tropical Africa. Upper Guinea : Liberia ; within 20 miles of Kakatown, *Whyte*.

1359. **Drypetes verrucosa**, *Hutchinson* in Dyer, Fl. Trop. Afr. vol. vi., sect. 1, p. 677, *anglice* [Euphorbiaceae-Phyllantheae] ; affinis *D. lacinintae*, Hutchinson, sed stipulis brevioribus, sepalis 5 differt.

Arbor 17–22 m. alta ; ramuli pubescentes. *Folia* oblongo-elliptica vel lanceolato-elliptica, breviter acuminata, basi rotundata et inaequalia, 12–18 cm. longa, 6–7·5 cm. lata, tenuiter chartacea, spinuloso-dentata, utrinque glabra costa subtus pubescente excepta, supra nitida, subtus pallida, nervis lateralibus utrinque 6–8 patulis intra marginem anastomosantibus supra leviter immersis subtus prominentibus, venis utrinque distinctis ; petioli 4–6 mm. longi, verrucosi, puberuli ; stipulae laciniatae, circiter 6 mm. longae, segmentis subulatis. *Flores* ♂ non visi. *Flores* ♀ in trunco fasciculati ; pedicelli validiusculi, 1·2–2 cm. longi, parce puberuli, demum glabrescentes. *Sepala* 5, suborbicularia, coriacea, utrinque glabra, margine minute ciliolata. *Discus* cupularis, dense tomentosus. *Ovarium* tomentosum, stigmatibus 3 planis adpressis reniformibus circiter 3 mm. latis marginibus crenulatis. *Fructus* ovoidei, integri, fere 4 cm. longi, endocarpio osseo vix 2 mm. crasso intus nitido. *Semina* elongato-ellipsoidea, 2 cm. longa, 0·8 cm. lata ; testa nitida, crustacea. *Cyclostemon verrucosus*, Pierre ex Hutchinson, l.c. 678, nomen.

Tropical Africa. Lower Guinea : Gaboon ; in the neighbourhood of Libreville, *Klaine*, 2382, 2482, 2589.

1360. **Hasskarlia minor**, *Prain* [Euphorbiaceae - Crotoneae] ; species herbacea habitu *Mercurialem perennem*, Linn. simulans, ideoque a speciebus arborescentibus adhuc notis quam maxime distincta.

Herba glaberrima, caulibus 3–5 dm. altis, teretibus superne ramosis. *Folia* caulina decussatim opposita, membranacea, breve petiolata, anguste ovata, abrupte longiuscule caudato-acuminata, basi angustata, margine dimidio superiore crebre minute argute serrata, 2·5–3 cm. longa, 1–1·5 cm. lata ; petiolus 3–4 mm. longus : stipulae ovatae, membranaceae, deciduae ; folia ramulorum inferiora opposita sed manifeste anisophylla, superiora alterna. *Flores* masculi spicati ; spicae versus apices ramulorum oppositifoliae, densiflorae, perbreves, 3–7 mm. longae. *Calyx* maris 3-partitus ; lobi ovati, valvati. *Stamina* 3, receptaculo affixa, filamentis obsoletis ; antherae erectae usque ad basin in locellos 4 demum distinctos erectos subglobosos ab apice dehiscentes divisus. *Ovarii* rudimentum distinctum colnmnare. *Flores* feminei ignoti.

Tropical Africa. Upper Guinea : Sierra Leone ; Limba, near Bendembu, *Scott Elliot*, 5680.

Except for the presence of a distinct though very short rudimentary ovary the male flowers of this species are exactly like those of *H. didymostemon*, Baill., and *H. oppositifolia*, Pax.

1361. **Tragia (Tagira) akwapimensis**, *Prain* [Euphorbiaceae-Crotoneae] ; species *T. Schweinfurthii*, Baker, valde affinis sed foliis apice obtusis, margine minus serratis racemisque masculis longioribus longeque pedunculatis satis distincta.

Herba, caulibus suberectis 4·5–6 dm. altis, basi lignosis, valde ramosis, parce puberulis pilisque urentibus paucioribus armatis. *Folia* sessilia vel brevissime petiolata, ascendentia, firmula, lanceolata, apice mucrónulata obtusa, basi breve cuneata vel rotundata, margine parce breviter setosa, versus apicem pauci-serrata ceterum integra, 4–5 cm. longa, 8 mm. lata, utrinque secus nervos parcissime breviter setosa ceterum glabra ; petiolus 0–4 mm. longus, parce setosus pilisque urentibus obsitus ; stipulae lanceolatae, 2–3 mm. longae, rigidae, reflexae, glabrae vel parce setosae. *Racemi* 1-sexuales, dioici, terminales vel oppositifolii, maris 15–25 cm. longi, pedunculo nudo rhachideque parce puberulo pilisque paucis urentibus obsito 5 cm. longo suffulti ; flores numerosissimi, remotiusculi ; pedicelli breviter pilosi sub quaque bractea solitarii vel nodis 2–3 imis casu geminati bracteas haud excedentes ; bracteae lanceolatae, 2 mm. longae, parce pilosae. *Sepala* maris 3, late ovata, extra parce breviter pilosa. *Stamina* 3 ; filamenta antheris distincte longiora. *Flores feminei* nondum visi.

Tropical Africa. Upper Guinea : Gold Coast ; Aburi, *J. Anderson*, 54.

Evidently very nearly allied to *T. Schweinfurthii*, Baker, from Dar Fertit, also a dioecious species ; the Gold Coast plant is, however, readily distinguished by its obtuse, less serrate and nearly glabrous leaves and by its much longer male racemes.

1362. **Tragia (Agirta) Baroniana**, *Prain* [Euphorbiaceae-Crotoneae] ; species *T. Boiviniana*e, Muell.-Arg., quam maxime affinis sed foliis subpersistenter pilosis margine crebre minute dentatis, laciniisque calycis feminei paucioribus margine breviter laciniatis differt.

Frutex ramis suberectis lignosis, dense rufo-puberulis. *Folia* brevissime petiolata, membranacea, elliptica, acuta, basi late cuneata vel rotundata, margine minute crebre denticulata, 6–10 cm. longa,

3–4 cm. lata, utrinque adpresse cinereo-pubescentia ; petiolus 4–5 mm. longus, dense rufo-puberulus ; stipulae lanceolatae, 3 mm. longa, rufo-puberulae. *Racemi* terminales et laterales oppositifolii, 6–10 cm. longi, pedunculo rufo-tomentello 1–2 cm. longo suffulti, supra flores masculos prope basin flores femineos gerentes ; flores utriusque sexus fere sessiles sub quaque bractea singuli ; bracteae ovato-lanceolatae, acutae, dense puberulae, 1·5–2 mm. longae. *Sepala* maris 3, ovata, subacuta, extra dense pubescentia. *Stamina* 3, centrum floris occupantia ; antherae sub anthesin reflexae, horizontales. *Sepala* floris feminei saepius 3, margine breviter utrinsecus pinnatim 6-lobulata, extra dense pubescentia. *Ovarium* dense velutinum ; styli 3, basi tantum connati, reflexi. *Capsula* 3-cocca, dense cinereo-pubescens ; cocci subglobosi. *Semina* globosa, brunnea, albo-maculata.

Madagascar. Central Madagascar, *Baron*, 2712.

In spite of the numerous differences between the two, this species and the plant described by Mueller, l.c., as *T. Boiviniana* evidently belong to the same natural section ; the stamens in appearance and position are identical in both. Through the kindness of Professor Engler, we have been able to examine a specimen of Hildebrandt, n. 3179 from Nossi-bé, which is identical with Boivin n. 2177/3 from the same locality, on which *T. Boiviniana* was based. Hildebrandt's specimen has ripe fruits. The capsule is 3-coccous, deeply 3-suleate, 6 mm. across, sparily beset with weak white bristles. The seeds are globose, pale yellow with small pale brown streaks and blotches.

1363. **Tragia (Tagira) bongolana**, *Prain* [Euphorbiaceae-Crotoneae] ; species *T. miti*, Hochst., proxima a qua differt floribus masculis multo majoribus, pedicellis brevioribus, filamentisque longioribus.

Herba caulibus elongatis, volubilibus, parce retrorsim hispidis. *Folia* distincte petiolata, firmula, triangulari-ovata, acuta, basi distincte cordata, margine serrata, 5–7·5 cm. longa, 3·5–4 cm. lata, secus nervos utrinque parce hispida, aculeisque perpaucis urentibus obsita ; petiolus 2 cm. longus, retrorsim hispidus ; stipulae lanceolatae, reflexae, marginibus hispidae, 3 mm. longae. *Racemi* caulem ramosque terminantes, 1-sexuales, dioici, ad 10 cm. usque longi, densiusculi, pedunculo nudo retrorsim hispido 0·5–·25 cm. longo suffulti ; pedicelli sub quaque bractea terni, hispidi, bracteis breviores ; bracteae ovato-lanceolatae, marginibus hispidae, reflexae, 2 mm. longae. *Sepala* maris 3, late-ovata, obtusa, firmula, glabra. *Stamina* 3 ; filamenta antheris parum longiora. *Ovarii rudimentum* parvum. *Flores feminei* ignoti.

Tropical Africa. Nile Land : Bongo ; Sablei, *Schweinfurth*, 2729. Mittu ; between Karo and Reggo, *Schweinfurth*, 2782.

Most nearly related to *T. mitis*, Hochst., with which it agrees in being dioecious, but differing sufficiently in the points noted above to be considered specifically distinct. *T. mitis*, Hochst., itself also a very distinct species, well discriminated by Richard, has by many authors been confused with *T. cordifolia*, Vahl (*T. cordata*, A. Rich.). The two are readily recognised, because *T. cordifolia* is monoecious, is rather copiously armed with stinging hairs, and has the male flowers mostly solitary to their bracts though they may be casually in pairs near the base of the raceme, whereas *T. mitis* has

no stinging hairs and is always dioccious, the male flowers being in glomerules of three above, and in lax 3-flowered cymules below.

1364. **Tragia (Tagira) incisifolia**, *Prain* [Euphorbiaceae-Crotoneae]; species *T. minori*, Sond., accedens sed foliis laciniatis, racemis brevioribus, capsulisque minoribus distincta.

Herba caulibus nunc brevibus herbaceis e basi lignoso, nunc elongatis prostratis lignosis ramos plurimos herbaceos simplices raro iterum virgatim ramosos emittentibus, caules vel rami herbacei 10–20 cm. longi, virides, parce puberuli vel pubescentes, aculeisque perpaucis albidis armati vel plane inermes. *Folia* sessilia vel fere sessilia, membranacea, ambitu anguste ovata vel ovato-lanceolata, acuta, basi cuneata, margine profunde laciniatim partita, lobis ovato-lanceolatis utrinsecus circiter 4 nunc integris nunc 1-dentatis apicem versus spectantibus; 1–1·5 cm. longa, 0·7 cm. lata, secus nervos supra parce subtus dense aculeis albidis brevibus setosa, laciniis dentibusque marginalibus singulis setam solitariam apicalem suffulcientibus; petiolus 0 vel 1 mm. longus, setosus; stipulae lanceolatae, reflexae, 2 mm. longae, glabrae. *Racemi* terminales, 1–1·5 cm. longi, pedunculis puberulis vel pubescentibus aculeatisque, 0·5–0·7 cm. longis suffulti, floribus masculis pluribus densiuscule aggregatis femineisque basalibus 2–3 onusti; pedicelli utriusque sexus sub quaque bractea solitarii eaque breviores; bracteae ovato-lanceolatae, bracteolaeque ovatae acutae margine setosae ceterum glabrae; bracteae maris 2 mm., feminei 3 mm. longae. *Sepala* maris saepissime 4, nonnunquam 5, raro 3, ovata, acuta, apice incrassata, induplicato-valvata, subcarnosa, glabra. *Stamina* 4–5, raro 3, filamentis antheris fere duplo longioribus. *Sepala* feminei 6, 2-seriata, accrescentia, subcoriacea, alterna ovato-lanceolata et late ovata, latiora utrinsecus 4–5-lobulata, angustiora 3–4-lobulata, extra setosa, intus glabra, lobulis singulis setam singulam terminalem gerentibus. *Ovarium* dense hispidum; styli 3, fere liberi, basi in columnam perbrevem tantum connati. *Capsula* 3-cocca, parce setosa, 0·7 cm. lata; cocci subglobosi. *Semina* globosa, pallide cinerea, maculis brunneis notata.

South Africa. Transvaal: between Koomati River Drift and Crocodile River, *Bolus*, 9779; Koomati Poort, on hills at about 300 m. elevation, *Schlechter*, 11,781.

A very distinct species, which cannot be confused with any other African one.

1365. **Tragia (Tagira) insuavis**, *Prain* [Euphorbiaceae-Crotoneae]; species *T. glabrescenti*, Pax, quam maxime affinis, differt tamen foliis bracteisque multo majoribus, fructu majore, calycisque feminei lobis post anthesin plane pinnatim nec palmatim lobatis.

Herba caulibus e basi lignoso suberectis demum volubilibus, junioribus minute puberulis inermibus. *Folia* distincta petiolata, membranacea, ovata vel oblonga, acuta vel breviter acuminata, basi paullo cordata, margine grosse serrata, 5–10 cm. longa, 3–5·5 cm. lata, utrinque secus nervos parcissime pubescentia ceterum glabra; petiolus 2·5–4 cm. longus, minute puberulus pilisque rigidis perpaucis obsitus; stipulae ovato-lanceolatae, extra puberulae, intus glabrae, 2 mm. longae. *Racemi* laterales oppositifolii, 2–2·5 cm. longi, pedunculis puberulis 5–9 mm. longis suffulti, floribus masculis plurimis densiuscule aggregatis femineoque basali singulo onusti; pedicelli utriusque sexus sub quaque bractea solitarii eaque breviores;

bracteae late ovatae, acutae, firmulae, marginibus pubescentes et minute glandulosae, ceterum glabrae ; bracteolae bracteis similes nisi minores, bracteae maris 3 mm. feminei 4 mm. longae. *Sepala* maris 3, lutea, orbicularia, glabra. *Stamina* 3, filamentis perbrevibus. *Sepala* feminei 6, 2-seriata, accrescentia sed minopere indurata, 8 mm. longa, pinnatim utrinsecus 5–6-lobulata, rhachide late oblongo-lanceolata, lobulis triangularibus latitudinem rhachidis haud excedentibus, extra rhachideque aculeis albidis parce setosis. *Ovarium* parce hispidum ; styli 3, dimidio inferiore in columnam connati. *Capsula* 3-cocca, parce setosa, 1 cm. lata ; cocci subglobosi.

Tropical Africa : Mozambique Dist. German East Africa ; Kilimatinde, 1065 m., *von Prittwitz.*

1366. **Tragia (Tagira) physocarpa,** *Prain* [Euphorbiaceae-Crotoneae] ; species e grege *T. cordifoliae*, Vahl, calycis feminei segmentis elongatis longissime lobulatis capsulaque pro genere maxima insignis.

Herba vel *suffrutex* caulibus erectis lignosis e basi lignoso ortis, sursum valde ramosis, ramis elongatis gracilibus herbaceis deorsum strictis sursum volubilibus, minute pubescentibus, inermibus. *Folia* distincte petiolata, membranacea, pallide viridia, ovato-triangularia, acuminata, basi distincte cordata, margine distincte serrata, 5–6 cm. longa, 2–2·5 cm. lata, supra secus nervos parce pubescentia et parcissime aculeata, subtus secus nervos densiuscule aculeata ; petiolus 2–2·5 cm. longus, minute pubescens, inermis ; stipulae lanceolatae, erectae, puberulae, 3 mm. longae. *Racemi* laterales oppositifolii, 5 cm. longi, pedunculo nudo puberulo parceque aculeato 2–2·5 cm. longo suffulti, floribus numerosis laxis masculis supra et femineis basalibus saepius 2 onusti ; pedicelli sub quaque bractea singuli eaque breviores ; bracteae tenue membranaceae, maris 2 mm. longae, anguste lanceolatae, reflexae, parce pubescentes, feminei ovato-lanceolatae, 4–5 mm. longae, distincte utrinsecus 1–3 dentatae, bracteolae bracteis similes nisi minores, integrae vel utrinsecus 1–2-dentatae. *Sepala* maris 3, oblonga, subacuta, extra puberula. *Stamina* 3 ; filamenta perbrevia. *Sepala* feminei 6, 2-seriata, oblonga, valde accrescentia nec tamen indurata, tandem 1·5 cm. longa, pinnatim utrinsecus 4-lobulata ; lobuli adscendentes anguste lanceolati 8 mm. longi, rhachideque pubescentes marginibusque dense aculeolati. *Ovarium* fere glabrum ; styli 3, basi in columnam brevem connati. *Capsula* 3-cocca, parce albido-aculeolata, valvis tenue coriacea, 1·8 cm. lata.

Tropical Africa. Lower Guinea : German South-west Africa ; Owambo, at Otavi, *Dinter*, 753.

1367. **Tragia (Tagira) Rogersii,** *Prain* [Euphorbiaceae-Crotoneae]; species *T. lukafuensi*, De Wild., habitu congruens, sed foliis inermibus basi rotundatis vel subtruncatis nec subhastato-auriculatis differt.

Caules numerosi e basi lignoso erecti, caespitosi, vix ramosi, 20 cm. alti, laxiuscule molliter pubescentes, inermes. *Folia* sessilia, ascendentia, membranacea, ovato-lanceolata vel oblongo-lanceolata, acuta, basi truncata vel rotundata, margine nisi basi integro minute crebre serrata, 3–3·5 cm. longa, 1 cm. lata, supra parce subtus praesertim secus nervos densiuscule molliter pubescentes ; petiolus 0; stipulae lineari-lanceolatae, patentes, membranaceae, 2 mm. longae, margine ciliolatae, ceterum glabrae. *Racemi* 1-sexuales, dioici,

terminales vel oppositifolii, masculi saepissime 5–7 cm. nonnunquam usque ad 16 cm. longi, pedunculo molliter pubescente vix 1 cm. longo suffulti, flores numerosissimos versus basin in cymulas 3-floras inter se 1–1·5 cm. remotas, versus apicem in glomerulos 3-floros 0·5 cm. remotos dispositos gerenentes; pedicelli pubescentes bracteis bracteolisque breviores, bracteae lineari-lanceolatae 1·5–2 mm. longae, bracteolae similes 0·5 mm. longae, margine pilosae, ceterum glabrae. *Sepala* maris ad normam 3, nonnunquam 4, raro 6, ovata vel ovato-lanceolata, acuta, intus parce puberula, extra parce pubescentia. *Stamina* 3; filamenta antheris longiora, basi explanata versus apicem incurva, antherae plane conniventes. *Flores* feminei ignoti.

South Africa. Transvaal: Waterval, *Rogers* (Transvaal Mus. Herb. 2597).

While so closely resembling in general habit and appearance the Lukafu plant described by Professor De Wildeman, this is clearly, from the shape of its leaves and the absence of stinging hairs, specifically distinct from *T. lukafuensis* and until the female flowers of both are known it would be rash to hazard the suggestion that they are closely allied; the probability indeed is that while *T. lukafuensis* belongs to the group which includes *T. Benthami*, Baker, and *T. Okanyua*, Pax, the species now described belongs rather to the group which includes *T. rupestris*, Sond., and its ally *T. minor*, Sond. It is to be remarked that whereas in *Tragia* it is not unusual for male flowers to have casually four or even five stamens, but much rarer to find more than three calyx-lobes, in *T. Rogersii* the number of calyx-lobes frequently exceeds three, but that even when there are as many as six calyx-lobes, the number of stamens does not exceed three.

1368. **Tragia (Tagira) shirensis**, *Prain* [Euphorbiaceae-Crotoneae]; species *T. Okanyua*, Pax, proxime accedens, differt foliis fere sessilibus basi haud auriculato-cordatis, pedicellis masculis longioribus, filamentis longioribus et calycis feminei segmentis difformibus.

Herba caulibus erectis crassiusculis e basi lignoso ortis, 30–45 cm. altis, plus minusve ramosis, densius pilis patentibus hispidis parceque aculeis urentibus armatis. *Folia* sessilia vel brevissime petiolata, ascendentia, membranacea, lineari-lanceolata, acuminata, basi breviter cuneata vel rotundata, margine crebre argute serrata, 5–8 cm. longa, 6–8 mm. lata, supra secus nervos strigosa, subtus secus nervos densius strigosa aculeisque urentibus obsita; petiolus 0–2 mm. longus, strigosus aculeatusque; stipulae lanceolatae, rigidiusculae, patentes, margine setosae, 3 mm. longae. *Racemi* androgyni, terminales, 2·5–8 cm. longi, pedunculo nudo strigoso 0·6–1·7 cm. longo suffulti, flores masculos plures cum 2–3 basalibus femineis gerentes; pedicelli filiformes parce pilosi, omnes bracteas excedentes, masculi terni, feminei solitarii; bracteae lanceolatae, membranaceae, margine setosae, 2 mm. longae. ♂ *Sepala* 3, ovata, acuta, extra parce pilosa. *Stamina* 3; filamenta antheris longiora. ♀ *Sepala* 6, 2-seriata, difformia, extra parce pilosa, demum accrescentia, coriacea, 3 exteriora ovata pinnatim utrinsecus 3–4-lobulata, lobulis brevibus ovatis acutis, 3 interiora palmatim divisa lobo centrali erecto oblongo-lanceolato margine integro lobulis basalibus lanceolatis reflexis patentibus. *Ovarium* parce hispidum et setosum; styli 3, ultra medium in columnam crassiusculam parce

setosam connati. *Capsula* 3-cocca, parce setosa, 1·25 cm. lata; cocci dorso obtuse angulati. *Semina* globosa.

Tropical Africa. Mozambique Dist. Nyassaland: Shire Highlands, near Blantyre, *Last*.

1369. **Plukenetia (Hedraiostylus) procumbens**, *Prain* [Euphorbiaceae-Crotoneae]; species a ceteris sectionis *Hedraiostyli* habitu prostrato, foliis basi late rotundatis nec cordatis nec auriculatim lobatis petiolisque perbrevibus facillime distinguenda.

Herba; caules sat numerosi e basi lignoso orti, crassiusculi, subcomplanati, procumbentes, diffuse ramosi, dense persistenter scabridiusculi. *Folia* subsessilia, firmula, subtus purpurascentia, late ovata, acuta, basi rotundata, margine nisi basi integro sat crebre acute serrata, 3–4·5 cm. longa, 2–3 cm. lata, basi manifeste 3-nervia, nervulis 2 marginalibus pergracilibus additis, supra saturate viridia, nitida, sub lente albido-punctata, subtus pallidiora, epunctata, utrinque secus nervos breviter scabridula, ceterum glabra; petiolus perbrevis, 2–3 mm. longus, scabridulus; stipulae lineares, minutae. *Racemi* simplices, terminales, 2·5–5 cm. longi; flores masculi pauci, feminei solitarii sub-basales; bracteae anguste lanceolatae; pedicelli utriusque sexus sub quaque bractea singuli, articulati. *Calyx maris* oblongus, glaber, valvatim 4-lobus; lobi lanceolati. *Stamina* circiter 12; filamenta brevissima; antherae subglobosae, loculis connectivo omnino adnatis. *Calyx feminei* glaber, 4-lobus; lobi ovati, acuti, imbricati. *Discus* 0. *Ovarium* dense strigosum, 4-loculare; ovula in quoque loculo solitaria; stylus crassus ovario subaequilongus, glaber, stigmatibus 4 oblongis cruciformiter patentibus minute papillosis coronatis. *Capsula* juvenilis 4-coccus; cocci dorso in alam explanati. *Semina* ignota.

Tropical Africa. Lower Guinea. Angola: Benguella; Ganguella, on the Cubango river at Princeza Amelia, 1520 m., *Gossweiler*, 2540.

1370. **Carex (Pseudo-cypereae) congolensis**, *Turrill* [Cyperaceae-Caricoideae]; ab affini *C. cognata*, Kunth, utriculis brunneis, nucibus stramineis oblongo-ellipticis differt.

Culmi robustiores, ad 4 dm. alti, apice concavi, trigoni, glabri. *Folia* ad 4 dm. longa et 5 mm. lata, apice acutissima, in marginibus minute scabra, vaginis (et foliis inferioribus) transversim lineolatis. *Spicae* 5–7-fastigiatae, fere sessiles, nisi ima remotiuscula pedunculo 3 cm. longo suffulta, 1–2 superiores ♂, lineari-oblongae, ad 4 cm. longae, reliquae cylindricae, 3–5 cm. longae, 0·75 cm. latae, densiflorae. *Bracteae* foliaceae, inflorescentiam superantes, usque ad 2 dm. longae. *Squamae* longe aristatae, in parte superiore et arista scabrae, dorso costa viridi excepta pallide ferrugineae; ♂ anguste obovatae, 6 mm. longae (arista inclusa), 1·5 mm. latae; ♀ lineari-oblongae, 4 mm. longae (arista inclusa), 1 mm. latae. *Utriculi* 4 mm. longi (rostro incluso), 1·5 mm. diametro, ellipsoidei, basi angustati, valide 12-nervati, brunnei, in rostrum laeve 1 mm. longum ore rigide et breviter bidentatum contracti. *Nux* laxe inclusa 2·3 mm. longa, 1 mm. diametro, oblongo-ellipsoidea, trigona, faciebus concavis, straminea. *Stylus* basi tortuosus. *Stigmata* 3.

Tropical Africa. South Central. Congo State: Katanga; Elisabethville, Lat. 11° 37′ S., Long. 27° 24′ E., 1150 m. Oct. 21, 1911. *F. A. Rogers*, 10,082.

XXVII.—TULIP WOODS AND TULIP TREES.

W. Dallimore.

Although the application of the same common name to several different kinds of woods must be misleading to persons engaged in the timber trade, it is of frequent occurrence, and the numerous kinds of gum, rosewood, cedar, pine and mahogany which are put upon the market may be cited as examples.

Tulipwood is another instance of the indiscriminate way in which the same name is applied to several woods which are quite distinct in character. A further complication is caused by other trees being known as tulip trees although their wood is not recognised as tulipwood.

In the "Diplomatic and Consular Report," No. 4818, which deals with the trade and commerce between France and French Guiana, it is stated that the wood of *Licaria guianensis*, (*Dicypellium caryophyllatum*), is known in England as tulipwood and in France as rosewood. This suggested that a compilation of the several timbers and trees to which the terms tulipwood and tulip tree are applied might be of value and the following list has been drawn up.

The term tulipwood appears to be associated with at least seven different kinds of trees. Two of these, *Harpullia pendula*, Planch., and *Physocalymma scabberrimum*, Pohl, are in regular use in the cabinet trade; the others, *Atalaya hemiglauca*, F. Muell., *Dicypellium caryophyllatum*, Nees., *Stenocarpus sinuatus*, Endl., *Owenia venosa*, F. Muell., and *Aphananthe philippinensis*, Planch., are less well known.

Harpullia pendula, *Planch.*—This Sapindaceous tree is found in the forests of New South Wales and Queensland, where it grows from 40 to 60 feet high with a trunk 12 to 24 inches in diameter. Its leaves are made up of from three to six, rarely more, ovate or oblong leaflets, and its small flowers, borne in loose panicles, are succeeded by winged fruits. The wood is tough, close-grained and beautifully marked with different shades of yellow, brown and black. The colour, however, appears to depend to some extent on soil or climatic conditions, for Maiden reports (Bulletin Dorrigo Forest Reserve), that samples of wood from the Bellinger and Dorrigo regions are less handsomely marked than others from the Richmond River and farther north. A plank specimen at Kew which measures 16½ inches in width, shows 7 inches of yellowish sapwood and 9½ inches of dark, prettily-marked heartwood. The wood is used for cabinet-making, furniture, panels for doors, &c. The same author in "Notes on the Commercial Timbers of New South Wales," refers to its use for billiard tables, and in "Useful Native Plants of Australia," to its being the best wood in Australia for lithographers' scrapers, and suggests a probable value for engraving.

Examples of the wood are to be seen in Museums Nos. 1 and 3 at Kew, and in the latter building, a table top partly made of this wood gives a good idea of its value for the manufacture of high-class furniture.

Physocalymma scaberrimum, *Pohl.*—The genus *Physocalymma* belongs to the Natural Order *Lythraceae* and is closely allied to the

genus *Lagerstroemia*. *P. scaberrimum* possesses the peculiarity so prevalent amongst the species of *Lagerstroemia* of being a highly ornamental flowering tree. It occurs in Brazil as a small deciduous tree 20 to 30 feet high with a trunk 18 inches in diameter. The ovate or broadly oval leaves are 3 to 4 inches long and 2 to 2½ inches wide, but in the variety *angustifolium* they are rather longer and narrower. Flowering occurs a few weeks before the young leaves expand, the red flowers appearing in large panicles from the ends of the branches.

The wood, as represented in Museum No. 1, at Kew, is heavy, close-grained, and red and yellowish-brown in colour when newly cut, the markings being of a curiously streaky character. There is, apparently, a strong disposition for the colour to fade, for the outer parts of old sections are various shades of brown. It takes a good polish and is used for cabinet work and for small fancy articles.

Descriptions of *P. scaberrimum* are given by Martius in the "Flora Brasiliensis," xiii, pt. 2, p. 343, and by Pohl in "Plants of Brazil," i, pp. 100–101, tt. 82–83.

Atalaya hemiglauca, *F. Muell.*—The wood of this Australian tree is known as western whitewood or western tulipwood, but it does not appear to be of much commercial importance. It is one of the *Sapindaceae* and occurs as a tall shrub or small tree in various parts of N. Australia, Queensland, and New South Wales. It is of interest owing to the diverse character of the leaves, which are sometimes pinnate and composed of an irregular number of linear leaflets, varying in length from 2 to 3 to 7 to 8 inches, sometimes simple and deeply lobed, or almost entire and up to 10 inches long, but it is not considered to be of much decorative value, for the flowers are small and the maple-like fruits have no special attractions.

Examples of the wood are not included in the Kew collection, but Maiden, "Forest Flora of New South Wales," ii, pp. 122–124, describes it as having light red sapwood and heartwood marked with dark red, or nearly black, patches or streaks. In other places the wood is described as yellowish with reddish marks. It is said to be close-grained, decaying easily, and though used to some extent for cabinet-work and turnery, to be of little value.

A useful pale-coloured gum, differing very little from purest gum Arabic, exudes from the tree, which Maiden, "Forest Flora of New South Wales," ii, p. 123, says would be an important article of commerce if obtainable in quantity.

Atalaya hemiglauca is planted as a shade tree, but its greatest economic importance lies in the fact of its leaves providing an important food for cattle and sheep in times of drought. From this it is sometimes called the "cattle bush."

Dicypellium caryophyllatum, *Nees*.—Descriptions of this tree appear in several works, notably Nees ab Esenbeck, Systema Laurinarum (1836), pp. 344–345; Martius, Flora Brasiliensis, v, pt. 2, p. 281, t. 102; and Aublet, Historie des Plantes de La Guiane Francaise (1775), i, p. 313, iii, t. 121. In the latter work the description appears under the name of *Licaria guianensis*. The plant is poorly represented at Kew, for the herbarium specimens are contained on one sheet and the museum material is limited to a

sample of bark. From what can be learnt of the tree it is plentiful in the Guianas and in Brazil, where it attains a height of 50 or 60 feet, with a trunk 3 feet or more in diameter with reddish, corrugated bark and strong, close-grained wood. It is a member of the *Lauraceae*, and possesses a character which is noticeable in many other plants belonging to the order, namely, that wood, leaves and bark are fragrant. Owing to its scented wood it has been given the common name of "bois de rose." It has also been called "Cayenne Sassafras."

A strong clove-like scent is present in the bark and for this reason it is known as "clove-bark" and "Brazilian clove-bark." The taste of the bark strongly resembles that of cloves, and powerful tonic properties are attributed to it. An essential oil, known as "clove-bark oil," which bears a strong resemblance in all its properties to "clove-oil," is obtained from the bark by aqueous distillation. It is used in perfumery, &c. (*see* Spon's "Encyclopaedia of the Industrial Arts," p. 1420; "The Volatile Oils," by E. Gildemeister and Fr. Hoffmann (1900), p. 393; "Odorographia," by J. Ch. Sawer (1892), p. 231, and (1894), p. 39).

Very little appears to have been written about the wood, and its importation into Europe seems to have begun quite recently. Although frequently mentioned as rosewood, the only reference to it as tulipwood which has been found is the one referred to in the "Diplomatic and Consular Report" previously mentioned.

Judging from the appended extract, the timber and oil of *Dicypellium caryophyllatum* are fast becoming important articles of commerce, and as there seems to be a disposition at the present time to exploit the forests of Brazil, it is quite probable that the trade in these products will undergo further developments.

Extract from "Diplomatic and Consular Report," No. 4818, Ann. Ser. France. Trade and Commerce of French Guiana.

"Rosewood (*Licaria guianensis*) [*Dicypellium caryophyllatum*], known in England as tulipwood.

"Since 1902 every report has mentioned an increase in this export. The year 1910 shows an export of 1262 tons, valued at 94,628 fr., against 2018 fr. in 1908 and 19,875 fr. in 1909, thus showing an increase of 74,753 fr. on 1909. The entire export was to Grasse (Alpes Maritimes), France. The wood is sold at 100 and 150 fr. per ton (locally).

"Essence of Rosewood.—Besides the export of wood, seven factories are now established for the extraction of the essence, which is shipped to France in carboys. The average product of one ton of wood is 22 lbs. of essence, the price in France being about 10*s*. per lb.

"The total export of this essence was :—

	Kilos.	Francs.
1908	7,470	186,750
1909	12,497	312,400
1910	22,066	551,650
Increase in 1910		239,250"

Owenia venosa, *F. Muell.*—This is an Australian tree, growing 30 to 40 feet high with a trunk 12 to 18 inches in diameter, belonging

to *Meliaceae*. The wood, as shown in Museum No. 1 at Kew, is reddish in colour, hard and close-grained. It is said to be easy to work, and to be useful for furniture and for wheelwrights' work. A reference to it as tulipwood will be found in Maiden's "Useful Native Plants of Australia," p. 581.

Aphananthe philippinensis, *Planch.*—A description of this tree occurs in the "Forest Flora of New South Wales," ii, pp. 71–73, and reference to it as tulipwood is made in "Useful Native Plants of Australia," p. 376. It is one of the *Urticaceae*, and forms a medium-sized tree with small, elm-like leaves; it attains a height of 50 to 70 feet with a trunk up to 4 feet in diameter, and is met with in the Island of Luzon, New South Wales, and Queensland. The wood, as represented in Museum No. 1 at Kew, is yellowish in colour, close-grained, and rather prettily marked. Maiden reports it as being used for turnery, linings, and ceilings, but to be in bad repute for durability.

Stenocarpus sinuatus, *Endl.*—In Museum No. 1 at Kew a specimen of the wood of this Proteaceous tree is shown under the common name of tulipwood, the name of tulip tree occurring in "Useful Native Plants of Australia," p. 600. The wood is described as nicely marked, close-grained, hard, durable, and admitting of a good polish. It is used for staves, veneers, and cabinet work. The tree grows 60 to 70 feet high, with a trunk 2 feet in diameter.

The name of Tulip Tree is given to at least four different kinds of trees, one belonging to *Magnoliaceae*, and the other three to *Malvaceae*.

Liriodendron Tulipifera, *L.*—This well-known Magnoliaceous tree, to which reference was made in the *Kew Bulletin*, No. 5, 1911, p. 214, is the most familiar tulip tree in temperate regions. It is a native of the United States, and its timber holds an important place amongst commercial woods. Instead of being called tulipwood, however, it is known under a variety of names, such as white poplar, yellow poplar, whitewood, canary whitewood, basswood, &c.

Lagunaria Patersoni, *D. Don.*—In the "Forest Flora of New South Wales," i, pp. 113–115, Maiden describes this species as the she oak or tulip tree of Australia. It inhabits Norfolk Island and the coast region of Queensland, where it forms a spreading tree 40 feet high, with large showy flowers. The wood is said to be scft and valueless, having little to recommend it even for firewood. The chief value of the plant lies in its decorative character and its ability to withstand a salty air and a humid climate. For this reason it is chosen for street planting in some coastal towns in Australia.

Thespesia populnea, *Sol.*—This is a small Malvaceous tree found in Tropical Asia and Africa. W. A. Talbot describes it under the common name of tulip tree in the "Forest Flora of Bombay," i, (1909), and it is referred to under the same name by Brandis, "Indian Trees," p. 75. It forms a small, decorative tree, and bears evergreen, ovate leaves up to 7 inches long and 4 inches across, and large, showy, yellow and purple flowers. The wood is fairly strong and heavy, fine-grained, with light-coloured soft sapwood and hard,

red heartwood. It is used for gun-stocks, wheel-spokes, boat-timber, carts, and furniture. The bark yields a good fibre, and the capsules a yellow dye like gamboge. Both bark and wood contain tannin. A further description of the wood may be obtained from Gamble's "Manual of Indian Timbers," p. 88.

Hibiscus elatus, *Sw.*—This is known by the two common names of "blue mahoe" and "tulip tree." Stone, "Timbers of Commerce," p. 9, describes the wood as having a faint, aromatic or peppery scent, giving rise to sneezing when worked. It is used for gun-stocks, carriage poles, ships' knees, and fishing rods on account of its flexible character, and is compared to European ash, but is said to be more durable and longer in the fibre than that timber.

XXVIII.—MISCELLANEOUS NOTES.

Eduard Strasburger.—The news of the sudden death from heart failure of Professor Eduard Strasburger, in the night of the 19th of May, will have come with a great shock to all his friends and admirers. Nothing was known at Kew of any ailment having overtaken him, and when he paid his last visit to the Royal Botanic Gardens a very few years ago he seemed still to be in his usual good health and full of vigour and rare mental activity. He was in his 69th year, and his friends had just began to prepare for a fitting celebration of the 70th anniversary of his birthday by the publication of a "Festschrift" or jubilee volume, with contributions from his colleagues and pupils.

It is not intended in this place to deal in detail with Strasburger's achievements in the fields of botanical histology, morphology and cytology, the latter a discipline of which he was really the founder. His claims in those directions are recognised all over the world. Pathfinder, teacher and worker of the first order, he has opened out new roads and set up along them many a markstone that will endure. Pupils flocked to him from all countries, and not the least from England and America. It was not very many years ago that he came to this country on a long holiday to improve his practical knowledge of English so that he might be the better able to converse with those of his students whose linguistic facilities were confined to that language. At that time, and on other occasions, he was an enthusiastic visitor and admirer of the Royal Botanic Gardens and their treasures which his keen eye was quick to discover. He was never tired to point out the precious opportunities which await there the botanist who will avail himself of the hospitality of the establishment. He himself had not the time to settle down at Kew for research work, but he drew repeatedly on the resources of the Gardens and the Herbarium during a period of more than 35 years, the last time in connection with his studies on sexual and apogamous reproduction in *Urticaceae*.

He was not only a great man of science, but also a man of unusual breadth of thought and universal culture. No one has written more beautifully about the glories of the Riviera; and fascinating and stimulating as he appears to us in the "Rambles on the Riviera" so he was also in conversation, charming, many-sided and refined.

Strasburger was born in Warschau in 1844. He studied in Bonn and under Häckel in Jena, was appointed Professor of Botany and Director of the Botanic Garden at Jena in 1869, and went to Bonn in 1881, where, in the old Castle of Popplesdorf, he founded those laboratories which soon became a centre of active histological and cytological research. He was awarded the great Gold Medal of the Linnean Society in 1905, and in 1908 was one of the seven recipients of the Darwin-Wallace Medal, bestowed by the same Society on the occasion of the Darwin-Wallace celebration, the others being Wallace, Hooker, Häckel, Weissman, Galton and Ray Lankester.

O. S.

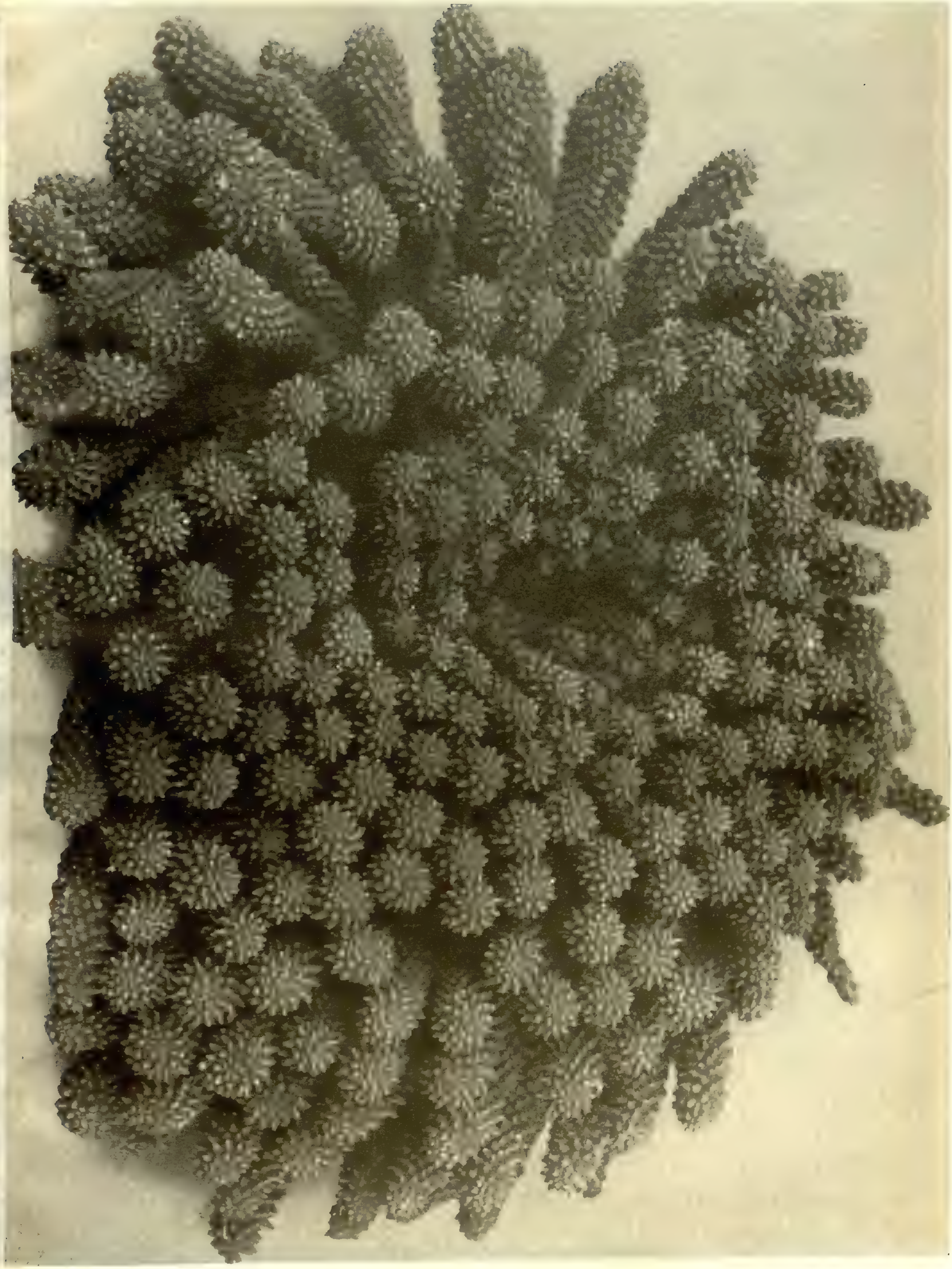
Two Interesting Euphorbias.—The accompanying Plate illustrates two fine specimens of *Euphorbia Caput-medusae*, Linn., and *E. multiceps*, Berger, which have recently been presented to the Royal Botanic Gardens, Kew.

The plant of **Euphorbia Caput-medusae**, *Linn.*, was collected on the slopes of Lion's Head Mountain, near Cape Town, by Mr. Eustace Pillans, and sent to Kew in December last. The specimen is 18 inches in diameter and consists of a globose main body about 6 inches in diameter, covered, except at the very centre, with numerous crowded cylindric branches; these in different individuals, vary from 2 to 15 inches long and $\frac{2}{3}$ to 1 inch thick, and are covered with obliquely conical tubercles. The flowers are clustered at the tips of the branches and are about $\frac{1}{2}$ inch in diameter, with 5 palmately-divided green and white glands and 5 incurved reddish lobes.

According to Mr. Alwin Berger this plant is not uncommon on the Continent, but no plant of it has been cultivated at Kew nor in any collection I happen to have seen during the past 39 years. A beautiful photograph of it growing wild is reproduced by Dr. Marloth in Wissensch. Ergebn. Deutsch. Tiefsee-Exped. vol. 2, pt. 3, t. 9, but the figure here given is the first and only one that has appeared in an English book giving a correct representation of the entire plant.

Very few plants have been more misunderstood than this, for when the species was founded by Linnaeus, according to the references he quotes, five or six distinct species were included under it and the varieties he made. In gardens also several species have been erroneously cultivated under the name of *E. Caput-medusae*. There is no specimen preserved in the Linnean Herbarium to prove which was Linnaeus' type, but, as he appears to have seen it growing in Clifford's garden, the cultivated plant would most probably be one found growing near Cape Town. The species here figured is the only one which grows around Cape Town to which the name and description could apply, and as it is recognised there as being *E. Caput-medusae*, it will be accepted as such for the Flora Capensis. Berger in his "Sukkulente Euphorbien," p. 110, has taken the same view of this species, whilst almost all other authors have mistaken other species for it or confused others with it.

Euphorbia multiceps, *Berger*, is one of the most remarkable species in the genus, being quite unlike any other *Euphorbia* or indeed any



EUPHORBIA CAPUT-MEDUSAE.

[To face page 246.

To face page 247.] EUPHORBIA MULTICEPS.

other known succulent plant. In rough comparison it may be likened to a green pine-apple with a number of spikes irregularly protruding from it. In structure it consists of a stout conical fleshy axis densely covered from the base nearly to the apex with short cylindric horizontally spreading branches, forming a conical mass varying from 3 inches to 2 feet in height and 3 to 10 inches in diameter at the base, according to age. From between the branches of younger plants, and from the tips of them also in old plants, arise the stout spine-like processes seen in the figure, which are really barren peduncles. Flowers have not been seen.

Although so different from *E. Caput-medusae* in appearance, *E. multiceps* is only a modification of the same type of structure. In the former the main axis does not elongate so fast as its branches, which therefore becomes 2–3 times as long as the main axis is high and spread out on all sides, forming a convex cushion-like mass. Whilst in the latter the main axis elongates much faster than its branches, which are always many times shorter than it, thus forming a conical mass.

E. multiceps is a native of South Africa, where it grows in the Karoo region around Matjesfontein and in little Namaqualand.

The plant represented in the photograph was received from Prof. H. H. W. Pearson in March, 1911, and was collected by him during the Percy Sladen Expedition in Namaqualand.

N. E. B.

Presentations to Museums.—The following miscellaneous specimens have been received in addition to those previously recorded in the Bulletin :—

Lochiel, Achnacarry, Inverness.—Transverse sections of wood of Larch and Oak.

Messrs. Dring and Fage, Stamford Street, London, S.E.—A collection of scientific Instruments used in Forestry.

Mr. James Whitton, Superintendent of Parks, Glasgow.—Sections of wood of *Abies concolor*, *A. Nordmanniana*, *A. nobilis*, *Picea sitchensis*, *Betula alba*, and *Ulmus campestris*.

Mr. W. W. Courtenay, Richmond, Surrey.—Section of stem of *Prunus domestica*, infested with *Stereum purpureum*.

Mr. M. T. Dawe, Mozambique.—Sliced tubers of Wild Yam (*Dioscorea* sp.).

Mr. V. F. Leese, Parkend, Gloucester.—Sections of Larch and Oak.

Messrs. Wigglesworth & Co., Fenchurch Street, London, E.C.—Sample of Sisal Hemp (*Agave rigida*, var. *sisalana*), from British East Africa.

Mr. H. R. A. Mallock, F.R.S., London, S.W.—Photographs of Branching Date Palms from Tenerife.

Mr. F. A. Stockdale, Botanic Gardens, Demerara.—Photographs of Coco de Mer (*Lodoicea sechellarum*).

Mr. R. C. Notcutt, Woodbridge.—Section of trunk and a plank of Corsican Pine (*Pinus Laricio*).

Mr. Stuart R. Cope, Westminster.—Seeds of *Manihot heptaphylla*.

Messrs. English Bros., Ltd., Wisbech.—Models of a Gate and Fencing in creosoted wood.

Lady Hooker, The Camp, Sunningdale.—Basket made by Fraser River Indians, British Columbia.

Mr. Leonard Cockayne, Christchurch, New Zealand.—Portion of plant of *Helichrysum coralloides*, found growing on dry rock at an altitude of 1500 m. on Shingly Range, Awatere, Marlborough, New Zealand.

Messrs. Cockarill Bros., Richmond.—Dart-board made of Elm.

Mr. Rex W. Brent, Forestry Department, Gold Coast.—A collection of fruits, seeds, &c., from the Gold Coast.

J. M. H.

Botanical Magazine for May.—The plants figured are *Davidia involucrata*, Baill., var. *Vilmoriniana*, Hemsl. (t. 8432); *Iris chrysographes*, Dykes (t. 8433); *Saxifraga lingulata*, Bellardi (t. 8434); *Hypocalymma robustum*, Lindl. (t. 8435) and *Calceolaria Forgetii*, Skan (t. 8436).

The *Davidia* is a medium-sized tree with linden-like foliage and large white leafy bracts borne in pairs beneath each head of flowers. It is a native of Central and Western China, and was first introduced into Europe in 1897, when Père Farges sent seeds to Messrs. Vilmorin of Paris. The solitary plant raised from these seeds flowered for the first time in the collection of Mr. M. L. de Vilmorin at Les Barres, Loiret, in 1906, and it was from this plant that the material for the figure was obtained, the fruiting specimen having been sent by Mr. Vilmorin in October 1908, and flowering specimens in May 1911. Père Farges sent home a further batch of seeds in 1898, and in 1899 Messrs. J. Veitch & Sons received a very large supply from their collector Mr. E. H. Wilson. Messrs. Veitch raised a great number of plants at their Coombe Wood nursery and one flowered there, for the first time in England, in May 1911. The variety figured, regarded by Mr. L. A. Dode as a distinct species, merely differs from the type by the absence of the white tomentum on the underside of the leaves.

Iris chrysographes was originally described last year from a specimen which flowered in Mr. W. R. Dykes' garden at Godalming. Mr. Dykes' plant was obtained as a seedling from Miss Willmott, in whose garden at Warley Place, Essex, it had been raised from seeds collected by Mr. E. H. Wilson in Western Szechuan. The species belongs to the section which includes *I. sibirica*, Linn. and is remarkable for its rich dark purple flowers of a velvety texture. The plant from which the material for the figure was obtained was grown by Mr. Dykes.

The handsome *Saxifraga lingulata*, a native of the Maritime Alps, has been cultivated at Kew for many years, where it is quite hardy, but owing to the impurities of the local atmosphere it is found that in order to secure the best development of the inflorescences the plants must receive the protection of a frame.

Hypocalymma robustum is a West Australian shrub belonging to the Myrtaceae, and half a century ago was often met with in English conservatories. In well-favoured localities it flourishes in a sheltered position out-of-doors, and from one of these, namely the garden of the late Mr. Gumbleton at Belgrove, Queenstown, the

material for the figure was sent. The species which constitute the genus *Hypocalymma* were formerly included in *Leptospermum*.

The *Calceolaria* is a pretty Peruvian species which has been introduced into cultivation by Messrs. Sander & Sons, who received seeds from Mr. Forget. It was at first identified with *C. virgata*, Ruiz and Pav., an imperfectly known species, but which, judging from a rather poor figure and description, differs in leaves and flowers from *C. Forgetii*. This is a free-flowering plant for the greenhouse or a sunny border. At Kew it has not proved hardy.

Botanical Magazine for June.—The plants figured are *Brachychiton acerifolius*, F. Muell (t. 8437); *Rupicola sprengelioides*, Maiden (t. 8438); *Ixora lutea*, Hutchinson (t. 8439); *Lycium pallidum*, Miers (t. 8440); and *Perovskia atriplicifolia*, Benth. (t. 8441).

The *Brachychiton* (often called *Sterculia acerifolia*) is a native of New South Wales and of Queensland, and is the familiar Flame Tree of the colonists. It is a tall tree, sometimes attaining a height of 120 feet, and has a soft light-coloured wood of coarse grain. The flowers, which are produced in large lax axillary panicles, are pendulous, bright pink, and very attractive. The species was first introduced into England in 1824, and a plant reached Kew in 1825. The material for the illustration was obtained from a plant, now about 40 feet high, which was presented to the collection by Messrs. James Veitch & Sons in 1862. This flowered for the first time in June, 1910.

Rupicola sprengelioides, an Epacrid, was discovered in the Blue Mountains of New South Wales, by Messrs. J. H. Maiden and W. Forsyth, in 1898, and the specimen figured was procured from a plant raised from seeds sent to Kew by Mr. Maiden in 1906. It is a small shrub with densely leafy branches, linear-lanceolate leaves, and axillary solitary milky-white flowers about $\frac{1}{3}$ inch long.

Ixora lutea is supposed to be of garden origin. Under the name of *Ixora coccinea* var. *lutea* it originally reached Kew about twenty years ago from the Royal Botanic Garden, Peradeniya, Ceylon. From the well-known *Ixora coccinea* it is easily distinguished by its laxer inflorescence, pale yellow flowers, and by its larger ovate-rhomboid corolla-lobes. Like several others of the genus, *I. lutea* is a valuable warm-house flowering plant.

The *Lycium* is described as the most effective species in cultivation. It is a native of the Southern United States and Northern Mexico, the form figured, which has been grown in the open at Kew since 1886, being from Colorado, and is distinguished from the New Mexican form by having the corolla-tube hairy inside below the insertion of the stamens instead of being quite glabrous. This species has pale greenish-yellow or almost white flowers about $\frac{3}{4}$ inch long, and red globose berries $\frac{1}{4}$–$\frac{1}{3}$ inch across.

Perovskia (often called *Perowskia*) is a somewhat anomalous genus of Labiatae comprising four species, natives of Central Asia, North-western India and Western Tibet. *P. atriplicifolia* is found in the mountains of Afghanistan and extends through the Western Himalaya to Western Tibet. It is a shrub, 3 to 5 feet high, with a paniculate inflorescence of rather small blue flowers. The plant which furnished the material figured was obtained from Messrs. Bees, Ltd., in 1906.

Forestry in South Africa.—The Report of the Conservator of Forests for the Union of South Africa for the year ending December 31st, 1910, has been received recently. It consists of 30 pages of letterpress and 12 of illustrations, and deals with the general management and work of the Department, making special reference to plantations formed for the supply of railway sleepers.

The chief items discussed are.—Extension and Constitution of State Forests ; Forest Settlements and Demarcations ; Management of State Forests ; Indigenous and Exotic Trees, with remarks on their interplanting ; Exploitation and Administration.

The fusion of the four large provinces, Cape, Transvaal, Orange Free State, and Natal, occurred during the year. This made it possible to place the whole of the State Forests under the control of one Department, thus facilitating economy of management.

An important step has been taken in the training of men to fill vacancies in the higher branches of the service. Hitherto such men were trained at considerable expense at the South African School of Forestry. It has now been decided, however, to draw them from the Oxford School of Forestry, preference being given to Rhodes Scholars. With this in view, arrangements are being discussed with the Rhodes Scholarships Trustees, whereby as the demand arises, a Rhodes Scholar, before proceeding to Oxford, may obtain a Government nomination which will entitle him to an appointment with a commencing salary of £200 per year on the satisfactory completion of his course of study. The work of the existing School of Forestry will in future be limited to giving elementary tuition in theory and science to men training for subordinate positions. A few of these men, however, who show special ability, may be admitted to the higher grade.

Exotic trees appear more popular than native trees for general planting. Various species of *Eucalyptus* are used in quantity as also are several species of Australian *Acacia*. *Acacia melanoxylon*, R. Br., is reported on very favourably and is said to be less liable to injury by fire than other trees. Of the various cypresses, *Cupressus arizonica*, Greene, has given the most satisfactory results and has grown well under peculiarly trying conditions in the Orange Free State and Transvaal. Numerous pines including *Pinus Pinaster*, Soland. ; *P. insignis*, Dougl. ; *P. patula*, Sch. & D. ; *P. Montezumae*, Lamb. ; *P. canariensis*, C. Sm. ; and *P. halepensis*, Mill., are reported upon favourably, although in some districts liable to disease. As is usually the case elsewhere, *P. insignis* grows remarkably fast and forms timber at a rapid rate.

In the Report, allusions are made to trials of various rubber-producing trees in Natal and to the turning of sand dunes into forest land with the aid of town refuse in the neighbourhoods of Port Elizabeth and Cape Town.

W. D.

Forest Flora of Bombay.* Mr. W. A. Talbot, until recently Conservator of Forests, to whose enthusiasm we owe much of our knowledge of the Flora of N. Kanara, has just completed his

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* Forest Flora of Bombay Presidency and Sind, by W. A. Talbot, F.L.S Conservator of Forests. 2 vols., 4to, pp. 508 and 574.

Forest Flora of the Bombay Presidency and Sind—a work which, as the author explains, is to be regarded as a more complete edition of his Trees, Shrubs and Woody Climbers of the Bombay Presidency.

From the valuable notes in the Introduction on the distribution of the Forest Flora within the district and throughout the book from the clear descriptions, economic notes, &c. the work should prove very valuable to Forestry officers since it embodies the experiences of one who has spent much time in the study of the woody plants of his area. A very brief perusal of the book suffices to convince one of the author's thorough knowledge of his district.

From the systematic botanists' point of view on the other hand the work is of somewhat less value. In the main the author has followed the recently completed flora for the same district by the late Dr. Cooke. One cannot, however, but come to the conclusion that such a handsome work would have been greatly improved had the author elected to follow the same course as the writers of the chief floras of India and elaborate his notes by work in a herbarium where authentic material could be consulted. As an example of the type of mistake which might then have been avoided *Chonemorpha macrophylla* may be cited. The Bombay plant is referred to this species—and here the author is but following earlier authorities—but the probability seems to be that the Bombay plant is distinct from both the Sikkim and the Sylhet one and that there are other imperfectly known species of the same genus in Burma. And again from the systematists' point of view it is to be regretted that no specimens are quoted under the species.

It must of course be borne in mind that Mr. Talbot was catering not for the systematic botanist but for the forestry officer. Still it is a matter of regret that Mr. Talbot has not been able to meet the requirements of both classes in a book conceived on so large a scale.

Both volumes are copiously illustrated, and although the type of illustration chosen may leave much to be desired the plates will no doubt afford the amateur some help in identification. Indices to the Native and English names as well as to the scientific names accompany each volume.

The work throughout is well printed and might with advantage be taken as a model by several of the other Government Printing establishments in India. W. G. C.

Introduction of Citrus by means of bud-wood.—In the Report of the Botanic Station, Dominica, for the year 1910–1911, recently published, an account is given on p. 3 of the work which is being done in the introduction of new varieties of *Citrus* into the Island.

It has been found by experience that budded plants of *Citrus* varieties fail to do well when introduced owing apparently to the fact that the stocks on which they have been budded are unsuitable to the local conditions.

The Curator of the Dominica Station has, therefore, been making experiments in budding *Citrus* on the local sour orange as a stock with conspicuous success.

Bud-wood of the Bahama grape fruit was obtained from the Nassau Botanic Station. The carefully-packed shoots, though they were over six weeks in transit, were successfully worked on the sour orange stocks in Dominica and 26 per cent. of the buds inserted grew.

Bud-wood has also been imported from Florida and Palestine.

The result is of considerable importance, as it used to be thought impossible to send bud-wood over long distances, and in order to introduce a new species or variety it was always considered necessary to obtain plants from Europe or America.

The Dominica experiments have proved that the introduction of plants has frequently led to failure, but that by means of bud-wood varieties may be introduced, and are now flourishing, which formerly had always been a failure. Further, that it is easier and cheaper to import bud-wood of standard varieties than to introduce budded plants.

It is of course essential that the nurseries should contain a good supply of healthy local stock on which to work the buds immediately after their arrival.

Shade and Mulch for Cacao.—In *Kew Bulletin*, No. 4, 1912, p. 177, reference was made to the cultivation of Cacao on Lord Glenconner's Ortinola Estate, Trinidad, and to the good effects of the liberal mulching there practised.

Numerous trees were being used experimentally for the combined purposes of giving partial shade and yielding material for mulch such as Erythinas, Albizzias, *Pithecolobium saman* and *Gliricidia maculata*. One tree which appeared to be particularly useful proves to be *Cassia grandis*, Linn. f., from specimens sent to Kew by Mr. W. Bain.

This tree can easily be climbed owing to its smooth stem, and yields a plentiful supply of leafy branches for use as mulch.

Mr. Bain, in his letter accompanying the specimens, writes on 12th May: "We have had an almost continual spell of dry weather since you left Trinidad [Feb. 6, 1912], and have had only about 21 inches of rain during the past eight months; we often get this rainfall in six or eight weeks. This weather is having a disastrous effect on the cocoa estates generally throughout the island. We have lost lots of the young fruit on the estate from want of sufficient moisture, but the pruning and mulching system here helps the trees to resist the effects of dry weather. So far we have got few dead trees compared to some plantations in the district."

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 6.] [1912.

XXIX.—FUNGI EXOTICI, XIV.

G. Massee.

The following new species of Indian Fungi have been sent to Kew by Mr. Burkill from Calcutta. The specimens were very well preserved, and were accompanied by coloured drawings by Mrs. Burkill and notes so that it has been possible to draw up descriptions under particularly favourable conditions.

Agaricaceae.

Lepiota mimica, *Massee*. *Pileus* carnosulus, campanulato-expansus, umbone valde prominente praeditus, longitudinaliter sericeo-fibrillosus, margine fimbriatus, siccus, albido-caesius, versus umbonem brunneus, 3–5 cm. latus. *Stipes* subcavus, sursum attenuatus, fibrillosus, glabrescens, pallido-fuscescens, 5–6 cm. longus; annulus albidus. *Lamellae* confertae, approximatae, latae, ex albido fuscescentes. *Sporae* ellipsoideae, albidae, 8 × 5 μ.

India. Calcutta: Maidan. On decaying mown grass, *E. M. Burkill*, 31.

In many respects closely resembling *Lepiota mastoidea*, Fries. Distinguished by its smaller size and crowded gills, which are only just free from the stem.

Lepiota punicea, *Massee*. *Pileus* carnosulus, campanulato-expansus, puniceo-lutescens, flocculoso-squamosus, centro squamoso-hirtus, 1·5–2 cm. latus. *Stipes* aequalis, fibrilloso-floccosus, pileo concolor, 3–4 cm. longus, circa 2 mm. crassus; annulus mox evanidus. *Lamellae* confertae, postice rotundato-liberae, ex albo luteolae. *Sporae* subglobosae, oblique apiculatae, 5 × 4 μ.

India. Calcutta: Secretary's Walk, *E. M. Burkill*, 23.

Allied to *Lepiota cinnabarina*, Alb. and Schw., differing in its smaller size, deciduous ring and subglobose spores.

Lepiota flavophylla, *Massee*. *Pileus* e convexo planus, sericeus, albidus, squamulis compressis brunneis variegatis, 2 cm. latus. *Stipes*

(24677—6a.) Wt. 189—808. 1125. 7/12. D & S.

sursum attenuatus, sericeus, albidus, 1·5–2 cm. longus; annulus membranaceus, persistens, albidus. *Lamellae* angustae, confertae, flavidae, acie fimbriata. *Sporae* ellipsoideae, hyalinae, 5 × 3 μ.

INDIA. Calcutta: Secretary's Walk, *E. M. Burkill*, 15.

Allied to *Lepiota citriophylla*, Berk. and Broome, from which it is distinguished by its smaller size, paler yellow gills, and smaller spores.

Lepiota sericea, Massee. *Pileus* primo campanulatus, dein hemispherico-expansus, 4–6 cm. latus, umbone prominulo levissimo ornatus, margine inflexo fibrilloso, totus pallide ochraceus, squamulas minutas gerens. *Stipes* teres, aequalis, pileo concolor, levissimus, 4–5 cm., ad tertiam superiorem annulo concolore. *Lamellae* confertae, a stipite remotae, candidae. *Sporae* ellipticae, hyalinae, 9 × 4·5—5μ.

INDIA. Calcutta: Indian Museum Compound; in plant pot and amongst grass, *E. M. Burkill*, 50, 32.

The colour of the cap is somewhat variable, sometimes with a tinge of brown, more especially at the disc. The stem becomes reddish-brown when dry, as also does the persistent ring. Allied to *L. excoriata*, Fries.

Clitocybe pumila, *Massee*. *Pileus* carnosulus, e convexo expansus, depressus vel subumbonatus, radiato-rugulosus, pallide umbrinus, depallens, 1–2 cm. latus. Stipes solidus, aequalis, pallidus, fibrillosus, saepe, incurvus, 1 cm. longus. *Lamellae* confertae, plus minusve decurrentes, sordidae. Sporae oblique ellipsoideae, hyalinae, 4 × 3μ.

INDIA. Calcutta: Secretary's Walk; about ants nests under a wall, *E. M. Burkill*, 10. Allied to *Clitocybe parilis*, Fries.

Tricholoma giganteum, *Massee*. *Pileus* carnosus, e convexo expansus, glaber, margine incurvo, flocculoso, glauco-caesius, aetate canescens, 30–35 cm. latus. *Stipes* solidus, fibrilloso-striatus, sursum incrassatus, pileo concolor, 15–18 cm. longus, 6 cm. crassus. *Lamellae* confertae, postice sinuato-emarginatae, ventricosae, stramineae. *Sporae* oblique ellipsoideae, hyalinae, 7 × 5 μ.

INDIA. Shamnagai; near Calcutta, *E. M. Burkill*, 44.

If the specimens and figures represent the normal condition of the fungus, it will rank amongst the largest of agarics, and is a very interesting addition to the mycological flora of India. Allied to *Tricholoma colossus*.

Volvaria castanea, *Massee*. *Pileus* carnosulus, cito explanato-expansus, margine subincurvus, centro non vel vix depressulus, glaberrimus, laete castaneus, 4–6 cm. latus. *Stipes* subcavus, aequalis, glaber, brunneo-tinctus, 4–6 cm. longus, volva ampla libera limbo lobata. *Lamellae* postice attenuato-liberae, ventricosae, confertae, sordidae incarnatae. *Sporae* subglobosae, leves, incarnato-tinctae, 7–8 μ.

INDIA. Calcutta: Secretary's Walk; under the north side of a wall, *E. M. Burkill*, 36.

Readily distinguished amongst known species by the bright chestnut-coloured pileus. Allied to *Volvaria media*, Schum.

Volvaria delicatula, *Massee*. *Pileus* membranaceus, siccus, e conico-campanulato explanatus, interdum subumbonatus, fibroso-sericeus, primitus incarnato-tinctus dein decoloratus, 1–1·5 cm. latus. *Stipes* aequalis, filiformi, fibrillosus, pallidus, 1–1·5 cm. longus; volva

libera, limbo lobato vel fimbriata, pallida. *Lamellae* liberae, confertae, ex albo incarnatae. *Sporae* subglobosae, roseo-tinctae, laeves, 4 × 3 μ.

INDIA. Calcutta: Secretary's Walk; under a wall. *E. M. Burkill*, 43.

A very beautiful little species, resembling *Volvaria temperata*, Berk., in size and general appearance, differing in the fibrously silky coloured cap, fimbriate limb of the volva and smaller subglobose spores.

Annularia Burkillae, *Massee*. *Pileus* carnosus, convexo-explanatus, subinde subdepressus, glaberrimus, levissimus, albidus, opacus, margine rectus, saepe fissus, rarius minutissime striatus, 8–12 cm. latus. *Stipes* solidus, rectus, teres, 7–10 × 1·5 cm. albus, primus pruinosus, dein glabratus, annulus parte tertia supera stipitis adnatus. angustus, albidus. *Lamellae* confertiusculae, latae, postice liberae, pallide incarnatae vel salmoneae. *Sporae* subglobosae, incarnato-tinctae, 7–8 × 5–6 μ.

INDIA. Calcutta: Maidan; at the roots of trees, *E. M. Burkill*, 6.

The genus *Annularia*, founded by Schulzer von Müggenberg in 1866, is remarkable for the size and elegance of the species included. It is morphologically, the exact counterpart of *Lepiota*, in the *Leucosporeae*, and is characterised by having free, flesh-coloured or salmon-coloured gills, and a fixed ring or annulus. *A. Burkillae* is most nearly allied to *A. insignis*, Cke. & Mass., which differs in the scaly cap and ring, and smaller spores.

Stropharia aurivella, *Massee*. *Pileus* carnosus, e convexo expansus, floccosus, aureus, centro squamosus, miniatus, 3–4 cm. latus. *Stipes* fistulosus, cylindricus, fibrillosus, supra annulum politus, pileo concolor, 4 cm. longus. *Lamellae* confertae, adnatae, ventricosae, nigro-violaceae, acie fimbriata. *Sporae* ellipsoideae, purpureo-tinctae, 6 × 4 μ.

INDIA. Calcutta: Maidan; among grass, *E. M. Burkill*, 33.

A very beautiful fungus, well marked by the floccose, golden-yellow cap ornamented with vermilion scales at the centre. Allied to *Stropharia aureo-fulva*, Berk., also an Indian species, which differs in the acutely umbonate pileus and erect ring.

Agaricus squalidus, *Massee*. *Pileus* carnosus, e convexo expanso-subumbonatus, siccus, fibrilloso-squamulosus, margine fibrilloso persistente, pallide brunneus, centro obscuriore, 5–6 cm. latus. *Stipes* solidus, aequalis, leniter flexuosus, 5–6 cm. longus, fibrillosus, pileo concolor; annulus membranaceo-tomentosus, persistens. *Lamellae* confertae, angustae, brunneae dein nigricantes. *Sporae* oblique ellipsoideae, obscurae, 7 × 4 μ.

INDIA. Calcutta: Secretary's Walk, *E. M. Burkill*, 11.

Allied to *Agaricus silvaticus*, Fr., which differs in the hollow stem and larger spores.

XXX.—MARINE ALGAE FROM NORTH OF NEW ZEALAND AND THE KERMADECS.

A. D. Cotton.

The marine algae of New Zealand are better known than those of any other country in the southern hemisphere. Many collections have been brought or sent to Europe, and during recent years Mr. R. M. Laing, together with other workers, has done much in discovering the rarer and less conspicuous species. His revised list of New Zealand algae (1899–1901) has proved most useful, and is generally regarded as a fairly complete list of the algal flora. Whilst this is true with regard to well-worked centres, it appears that in other parts, especially in the North Island, there is still ample scope for the marine botanist.

Amongst collections of marine algae received at Kew during the last few years were two forwarded by Miss Edith M. Smith from Little Barrier Island. These not only supplied species which were entirely unrepresented in British Herbaria, but contained representatives of important genera, which hitherto were not known to occur in New Zealand. Though only a few miles south of the Bay of Islands, the algae of which have been investigated by several botanists, the Little Barrier district is evidently well worth exploring. Miss Smith also collected at North Cape, and other spots in the North Island, but all the species forwarded from these localities were contained in the Little Barrier collection. A gathering from the Kermadecs however deserves special mention, as, previous to the paper recently published by Mr. and Mrs. Gepp, nothing was known of the algae of these islands. The group lies some 700 miles N.E. of Auckland, and is thus sufficiently distant from New Zealand for the flora to be of considerable interest. A general account of the botany and geology has been provided by Mr. R. B. Oliver (Trans. New Zeal. Instit. vol. xlii, 1909, p. 118–175), and the features of special interest to the algologist as described by Mr. Oliver were summarized by Mr. and Mrs. Gepp (Journ. Bot. xlix. 1911, p. 17). Miss Smith's gathering consisted only of a dozen plants, but it contained a well-marked species of *Haliseris* which proved to be undescribed.

Of the genera added to the New Zealand flora, two are members of the *Dictyotaceae*, namely *Gymnosorus nigrescens*, and *Taonia australiaca*, and two, *Galaxaura* sp. and *Liagora Harveyana*, are members of the tropical or warm-temperate *Florideae*. All four are probably Australian species, but in the present confused state of the literature it is impossible to determine the *Galaxaura*. Another Australian addition is *Nemastoma Feredaya*, and with it occurred the rare and apparently endemic *N. laciniata*. The discovery of *Haliseris* in the Kermadecs is interesting, as though well represented in Australia the genus is not known in New Zealand.

The two subjoined lists contain the names of the species forwarded from Little Barrier Island and the Kermadec group respectively. Common and generally distributed plants such as *Ulva Lactuca*, *Enteromorpha* spp. etc. are not included, neither are those which could only be named generically. With regard to Australian distribution, when no special area or colony is indicated the plant may be regarded as widely spread.

Little Barrier Island.

Cladophora herpestrica, *Kütz.*, Spec. Alg., p. 415; Harv. in Hook. Fl. Nov. Zel. ii, p. 262.

A very distinct species occurring in sandy soil.
Distr. North Island, New Zealand.

Caulerpa hypnoides, *Ag.*, Spec. Alg., i, p. 443; Harv. in Hook. Fl. Nov. Zel. ii, p. 260.
Distr. Australia, New Zealand.

Sargassum Sinclairii, *Hook. et Harv.* in Lond. Journ. Bot. iv, p. 522; Harv. in Hook. Fl. Nov. Zel. ii, p. 211.

The common representative of the genus in New Zealand. Most of the other species recorded by Harvey (Fl. Nov. Zel.) are now excluded or referred to other genera, Laing indeed in his revised list retaining only *S. verruculosum*, Ag. (= *S. Raoulii* and *S. adenophyllum*, Fl. Nov. Zel.).
Distr. New Zealand, Chatham Islands, Kermadecs? (Spec. in Herb. Brit. Mus.)

Carpophyllum Phyllanthus, *Hook. et Harv.* in Lond. Journ. Bot. iv, p. 525; Harv, in Hook. Fl. Nov. Zel. ii, p. 212.
Distr. New Zealand, Chatham Islands, Kermadecs.

C. maschalocarpum, *Hook. et Harv.* in Lond. Journ. Bot. iv, p. 526; Harv. in Hook. Fl. Nov. Zel. ii, p. 212.
Distr. New Zealand, Kermadecs.

C. plumosum, *J. Ag.*, De Alg. Nov. Zel., p. 11. *Sargassum plumosum*, Rich., Harv. in Hook. Fl. Nov. Zel. ii, p. 212.

Laing (l.c.) points out that he has not seen specimens of this species from the South Island, and that it appears to be a distinctly northern form.
Distr. North Island N.Z., Chatham Islands, Kermadecs.

Cystophora torulosa, *J. Ag.*, Spec. Alg. 1, p. 242; Harv. in Hook. Fl. Nov. Zel. ii, p. 214.
Distr. Australia, New Zealand.

C. retroflexa, *J. Ag.*, Spec. Alg. i, p. 243; Harv. in Hook. Fl. Nov. Zel. ii, p. 214.
Distr. Australia, New Zealand.

Xiphophora chondrophylla, *Mont.*, Prodr., p. 12; Harv. in Hook, Fl. Nov. Zel. ii, p. 215. *Fucodium chondrophyllum*, J. Ag., Laing Rev. List, p. 66.

Mrs. Gepp remarks that "The main point of difference from *X. Billardierii* consists in the entire absence of the long strap-shaped laciniae, all the branches of the thallus ending in short dichotomous forks which form the receptacles" (Phycol. Memoires No. vi, p. 36). The Little Barrier specimens are typical *X. chondrophyllum*, but since Agardh has cast doubt on the occurrence of *X. Billardierii* in New Zealand, it may be added that Lyall's specimens from Cook's Straits in the Kew Herbarium are certainly referable to that species. Laing moreover believes that *X. Billardierii* is common in New Zealand, and that *X. chondrophyllum* is probably only a variety. (*See* Laing in Chilton, Subantarctic Islands of New Zealand, ii, p. 500.)

Distr. Southern Australia, New Zealand, Chatham and Auckland Islands.

Splachnidium rugosum, *Grev.*, Syn. Alg., p. xxxvi; Harv. in Hook. Fl. Nov. Zel. ii, p. 215.

A most interesting note on the biology of this plant is given by Laing in Trans. N.Z. Instit. vol. xxv, p. 288.

Distr. Australia, Cape of Good Hope, New Zealand (E. Indies? *teste* J. Agardh).

Gymnosorus nigrescens, *J. Ag.*, Anal. Alg. cont. i, p. 12.

New to New Zealand. The specimen is very common in many parts of Australia and has lately been recorded from the Kermadecs (Gepp l.c.). It is curious that such a conspicuous and distinct plant should not have been previously detected, but it is probably confined to the northern parts of the North Island.

Distr. N. and S. Australia, Kermadecs.

Tonaria Turneriana, *J. Ag.*, Om Chatham-öarnes Alger, p. 438. *Z. interrupta*, Ag., Harv. in Hook. Fl. Nov. Zel. ii, p. 218, non alior.

Distr. N. and S. Australia, New Zealand.

Taonia australiaca, *J. Ag.*, Anal. Alg. cont. i, p. 30.

This species which is an addition to the New Zealand flora is comparatively rare. J. Agardh described the plant from Port Phillip Heads, Victoria, and Mr. and Mrs. Gepp record it from the Kermadec islands. A specimen from the same islands exists in the Kew Herbarium, collected during the visit of H.M.S. "Herald" in 1854, and labelled *Zonaria lobata*.

Distr. Victoria, Kermadecs.

Glossophora Harveyi, *J. Ag.*, Till. Alg, Syst. ii, p. 3. *Dictyota Kunthii*, Ag., Harv. in Hook. Fl. Nov. Zel. ii, p. 219, non alior.

Distr. New Zealand, Chatham Islands.

Perithalia capillaris, *J. Ag.*, Till. Alg. Syst. vi, p. 5.

Apparently a northern species, being previously only known from Thames and Great Barrier Island. Miss Smith's collections contain specimens from North Cape, Kermadecs, and Little Barrier.

Distr. North Island N.Z., Kermadecs.

Stypocaulon paniculatum, *Kütz.*, Spec. Alg., p. 467. *Sphacelaria paniculata*, Suhr, Harv. in Hook. Fl. Nov. Zel. ii, p. 221.

Very common in New Zealand.

Distr. Australia, New Zealand.

Stypocaulon funiculare, *Kütz.*, Spec. Alg., p. 467. *Sphacelaria funicularis*, Mont., Harv. in Hook. Fl. Nov. Zel. ii, p. 221.

Distr. New Zealand, Cape Horn, S. Chile, Tristan d'Acunha, S. Australia?

Liagora Harveyana, *Zeh*, MS.

The plants sent from Little Barrier are the same as those collected by Harvey in Victoria, and sent out by him as *L. viscida*, in his "Australian Algae" (354 B.) Dr. R. Pilger and Herr Zeh of Berlin have lately been working on the genus, and have examined the material in the Herbarium of the British Museum. Herr Zeh decided that the present species is distinct from *L. viscida* of

Europe, and labelled Harvey's specimen *L. Harveyana*, Zeh, ms Dr. Pilger informs me that the publication has been delayed but that the description of the new species will appear shortly.

This tropical and warm-temperate genus is new to New Zealand, but it appears to be plentiful in certain parts of the North Island. Mr. R. H. Shakespear, who forwarded the first batch of Miss Smith's material, remarks in a letter that he has since found *Liagora* in abundance at Tiri Tiri Island, 25 miles due south of Little Barrier. The plant resembles *L. viscida* in habit, but differs in certain structural details, which will doubtless be fully dealt with by Herr Zeh.

Distr. Victoria, Tasmania, North Island N.Z.

Scinaia furcellata, *Bivona* in L'Iride, 1822; Harv. in Hook. Fl. Nov. Zel. ii, p. 245.

Known in New Zealand from the North Island only.

Distr. Temperate and tropical seas.

Galaxaura, *sp.*

The species forwarded is the same as that which occurs in the Kermadecs (v. Gepp. l.c. p. 21). It was of interest to receive the plant from Miss Smith both from North Cape and from Little Barrier, as showing that though an addition to the New Zealand flora it is well established in the North Island. It is probably an undescribed species, but, for the reasons stated by Mr. and Mrs. Gepp, it appears most satisfactory to leave it for the present un-named.

Gelidium caulacantheum, *J. Ag.*, Epic., p. 548. (*G. corneum*, var. *subulifolium*, Harv. in Hook. Fl. Nov. Zel. ii, p. 243 ?)

Distr. New Zealand.

Pterocladia lucida, *J. Ag.*, Spec. Alg. ii, p. 483; Harv. in Hook. Fl. Nov. Zel. ii, p. 244.

Distr. Australia, New Zealand.

Gigartina divaricata, *Hook. et Harv.* in Flor. Antart., p. 75. *G. pistillata*, Lamour., Harv. in Hook. Fl. Nov. Zel. ii, p. 251, *partim.*

Distr. Australia, New Zealand.

G. alveata, *J. Ag.*, Spec. Alg. ii, p. 271; Harv. in Hook. Fl. Nov. Zel. ii, p. 252.

This curious and very distinct species appears to be somewhat rare and confined to the North Island. Banks' specimens are in the Kew Herbarium, and also Cunningham's and Hooker's. The two latter, together with Berggren's, were collected in the Bay of Islands.

Distr. North Island N.Z.

Gymnogongrus nodiferus, *J. Ag.*, Epic., p. 210. *G. furcellatus*, J. Ag., Harv. in Hook. Fl. Nov. Zel. ii, p. 250, *partim.*

Distr. New Zealand.

Melanthalia abscissa, *Hook. et Harv.* in Lond. Journ. Bot. iv, p. 548; Harv. in Hook. Fl. Nov. Zel. ii, p. 242.

Distr. New Zealand.

Plocamium costatum, *Hook. et Harv.* in Lond. Journ. Bot. vi, p. 404; Harv. in Hook. Fl. Nov. Zel. ii, p. 246.

Distr. Australia, New Zealand.

P. brachiocarpum, *Kütz.*, Spec. Alg., p. 885. *P. coccineum*, Lyngb., Harv. in Hook. Fl. Nov. Zel. ii, p. 245, *non* Lyngb.

Distinguished from *P. abnorme*, which it closely resembles, by the long-stalked, flabellately branched sporophylls, which spring from the sides of the branches.

Distr. New Zealand, Chatham Islands, Kermadecs.

Delisea pulchra, *Mont.* in Ann. Sci. Nat. Bot. 3 sér., t. i, p. 158.

Apparently rare in New Zealand, and probably confined to the warmer parts. Laing (l.c.) states that Berggren's specimen from the Bay of Islands is the only known record. Miss Smith sent three specimens—two from Little Barrier, and one from the Kermadecs. The plant is very apt to be confused with *Phacelocarpus Labillardeiri*, and it is quite possible that New Zealand collectors have mistaken it for that alga.

Distr. Australia, New Zealand, Kermadecs.

Asparagopsis armata, *Harv.* in Trans. Irish Acad. xxii, p. 544. *A. Delilei*, Harv. in Hook. Fl. Nov. Zel. ii, p. 233 (*non* Mont.).

Distr. Australia, New Zealand, Chatham Islands.

Laurencia distichophylla, *J. Ag.*, Spec. Alg. ii, p. 762 ; Harv. in Hook. Fl. Nov. Zel. ii, p. 234.

It is probable that New Zealand, and not South Africa, was the original locality for this species (*v.* J. Ag., l.c., p. 763). The plant is frequent in the North Island, several gatherings from various parts existing in the Kew Herbarium. Miss Smith's material was copious, and in fine condition.

Distr. New Zealand.

L. virgata, *J. Ag.*, Spec. Alg., ii, p. 752 ; Harv. in Hook. Fl. Nov. Zel. ii, p. 234.

To *L. virgata* both J. Agardh and Harvey refer a well-known New Zealand *Laurencia*, and Laing and others have followed them. It is doubtful if the plant is identical with the original *L. virgata* from the Cape, and in my Chatham Islands paper it was referred to *L. botryoides*, Gaill. (Kew Bull., 1907, p. 47). The latter is common in Australia, but as it appears to differ to a certain extent, it is perhaps advisable for the present to keep the New Zealand plant under *L. virgata*.

Distr. Cape, Australia, New Zealand.

Laurencia spp. Several other species of *Laurencia* were forwarded by Miss Smith, but none could be determined with certainty. One resembles very closely in habit *L. obtusa* of Europe, and another, a broad form of *L. pinnatifida*, but in the absence of a complete series it is impossible at present to feel confident as to their identity. The genus needs long and careful study in its natural habitat, and it is only by this method that the various forms can be correctly linked together. If collectors could send a set of specimens showing the variability displayed by each species, and the various forms of reproductive organs, it would greatly help to clear up the confusion existing in European herbaria. Falkenberg has recently shown that the nature of the antheridial conceptacle varies greatly in different species, and it is clear that systematists must in future give more attention to the nature of this structure.

Cladhymenia oblongifolia, *Hook. et Harv.*, in Lond. Journ. Bot. iv, p. 540; Harv. in Hook. Fl. Nov. Zel. ii, p. 235.

Distr. New Zealand, Chatham Islands.

Aphanocladia delicatula, *Falkenb.* in Engler and Prantl, Pflanzenfamilien, T. i, Abt. 2, p. 444. *Rytiphlaea delicatula*, Harv. in Hook. Fl. Nov. Zel. ii, p. 224.

See note in Kew Bulletin, 1909, p. 242.

Distr. New Zealand, New South Wales (*teste* Reinbold).

Euzoniella ovalifolia, *Falkenb.*, Rhodomelaceen, p. 369. *Polyzonia ovalifolia*, Harv. in Hook. Fl. Nov. Zel. ii, p. 226, tab. 112B.

A few fragments were found attached to *Cheilosporium corymbosum*. A rare plant, one gathering only being cited in Laing's List.

Distr. New Zealand, Chatham Islands.

E. incisa, *Falkenb.*, l.c., p. 369. *Polyzonia Harveyana*, Dcne., Harv. in Hook. Fl. Nov. Zel. ii, p. 227.

Falkenberg (l.c.) distinguished *E. Harveyana* (= *P. incisa*, var. *Harveyana*, J. Ag.) from the present plant, on the ground that the lowermost pinnules of each short shoot were branched. This characteristic is lacking in the Kew specimens, and it appears to me questionable whether Falkenberg's material was not exceptional, and that the two are not forms of one species, as was formerly supposed.

Distr. Australia and New Zealand.

E. adiantiformis, *Falkenb.*, l.c., p. 369. *Polyzonia adiantiformis*, Dcne., Harv. in Hook. Fl. Nov. Zel. ii, p. 226.

A few fronds of this rare species were found upon *Gigartina divaricata*.

Distr. New Zealand.

Dipterosiphonia dendritica, *Falkenb.*, l.c., p. 324. *Polysiphonia dendritica*, Ag., Harv. in Hook. Fl. Nov. Zel. ii, p. 223.

Distr. Australia and New Zealand.

Vidalia Colensoi, *J. Ag.*, Spec. Alg. ii, p. 1127. *Epineuron Colensoi*, Harv. in Hook. Fl. Nov. Zel. ii, p. 232.

Apparently common in the North Island, several localities being given by Laing. In a dried state, unless carefully examined, it is liable to be confused with *Phacelocarpus*.

Distr. North Island N.Z.

Euptilota formosissima, *Kütz.*, Spec. Alg., p. 671. *Ptilota formosissima*, Mont., Harv. in Hook. Fl. Nov. Zel. ii, p. 257.

Distr. Australia, New Zealand.

Ballia callitricha, *Mont.*, Voy. Pôle Sud., p. 94; Harv. in Hook. Fl. Nov. Zel. ii, p. 257.

Apparently neither this nor the following species have been previously recorded north of Lyall Bay in Cook's Strait.

Distr. Southern Australia, New Zealand, Chatham Islands.

B. scoparia, *Harv.*, Phyc. Austral., tab. 168. *Callithamnion scoparia*, Harv. in Hook. Fl. Nov. Zel. ii, p. 259.

See note above.

Distr. Southern Australia, Cape Horn, Falkland Islands, New Zealand.

Ceramium clavulatum, *Ag.* in Kunth. Syn. pl. aequin. 1, p. 2. *Centroceras clavulatum*, *Mont.*, Harv. in Hook. Fl. Nov. Zel. ii, p. 257.

Distr. Tropical and warm-temperate seas.

Microcladia Novae-Zelandiae, *J. Ag.*, Anal. Algol. cont. iv, p. 35.

Common south of Lyttleton (*teste* Laing). New Zealand specimens of this genus are not to be found in British herbaria.

Distr. New Zealand.

Nemastoma Feredeyae, *Harv.*, Fl. Tasm., p. 327, t. 195A.

New to New Zealand. The structure of *Nemastoma* is so distinct that there is no difficulty in ascertaining the generic position of the specimens. As far as can be seen, they differ in no way from *N. Feredeyae*, which is not uncommon in Victoria and Tasmania.

Distr. *Vide supra.*

N. laciniata, *J. Ag.*, Epic., p. 128.

The specimen agrees well with Agardh's description of *N. laciniata*, but the plant is not represented in British herbaria, and it appears to be of rare occurrence.

Distr. New Zealand.

Cheilosporium corymbosum, *De Toni*, Syll. Alg. iv, p. 1826. *Amphiroa corymbosa*, *Dcne.*, Harv. in Hook. Fl. Nov. Zel. ii, p. 237.

Distr. Australia, New Zealand.

C. elegans, *Aresch.* in J. Ag. Spec. Alg. ii, p. 546. *Amphiroa elegans*, Harv. in Hook. Fl. Nov. Zel. ii, p. 237.

Distr. New Zealand, Kermadecs.

Corallina Cuvieri, *Lamour.*, Pol. fléx., p. 286. *Jania Cuvieri*, Harv. in Hook. Fl. Nov. Zel. ii, p. 237.

Distr. Australia, New Zealand.

Jania micrarthrodia, *Lamour.*, Pol. fléx., p. 271; Harv. in Hook. Fl. Nov. Zel. ii, p. 237.

Distr. Australia and New Zealand.

Kermadec Islands.

The following twelve species were collected by Miss Smith during her stay in the islands; most were also found by Mr. Oliver, but several are additions (*see* Gepp, l.c.). Six species collected in the islands during the visit of H.M.S. "Herald" in 1854 and by the "Challenger" Expedition in 1874, have been observed in the Kew Herbarium, and two of these, not having been found by Miss Smith, are recorded in the list.

Cladophora fusca, *Martens*, Preuss. Exped., p. 22, tab. 3, fig. 1.

The specimens agree exactly with those received by Mr. and Mrs. Gepp. The plant was also found during the "Herald" visit, and thus, though rare and little known, is apparently common in the Kermadec group.

Distr. Tropical Pacific.

Carpophyllum maschalocarpum, *Hook. et Harv.* *Vide supra.*

C. Phyllanthus, *Hook. et Harv.* *Vide supra.*

C. elongatum, *A. et E. S. Gepp*, in Journ. Bot., xlix, 1911, p. 20.

See note on the synonomy of this species in the paper cited. A "Challenger" specimen collected 30 miles off Raoul Island exists in the Kew Herbarium. The plant was not found by Miss Smith.

Zonaria nigrescens, *J. Ag.*

The plant was also collected by Oliver. *See* note above.

Taonia australiaca, *J. Ag.*

Another rare and little known species. It was found in Little Barrier Island by Miss Smith, and in the Kermadec group both by Oliver and by the "Herald" botanists. *See* note above.

Haliseris Kermadecensis, *Cotton*, sp. nov.

Ab *H. Polypodioide* frondibus venosis, ab *H. Plagiogramma* sinubus frondium acutis recedit.

Frons 15–18 cm. alta, basi eximie stuposa et plerumque stipite longo ramoso suffulta, sensim in segmenta dichotoma sinubus acutis abiens. Segmenta 5–8 mm. lata, linearia, venosa, apice attenuata margine integerrima. Venae distinctae, circ. 1 mm. distantes, a costa ad marginem oblique excurientes. Tetrasporangia in soros elongatos collecta. Oogonia ignota.

Kermadec Islands. E. M. Smith, 1908.

The present species resembles in outward form specimens of *H. polypodioides* in which the segments are narrow and the axils decidedly acute. In structure, however, it is quite distinct, being closely allied to the West Indian *H. Plagiogramma*, and it is not without some hesitation that the plant is described as new. Its larger and apparently more robust fronds, together with its acute axils, furnish distinguishing macroscopic features: and coupled with these, the veins are found to be decidedly thicker, and more regularly developed than in *H. Plagiogramma*. In all the Kew specimens of the West Indian plant, there is moreover a tendency for the veins to be incompletely joined to the main nerve, a peculiarity which is not found in the Kermadec specimens. These differences appear to be of sufficient importance to warrant its being regarded as a distinct species, specially since there is no certain record of *H. Plagiogramma* occurring outside the West Indian region, and the north of S. America.

The only other species to which the plant could be referred is *H. australis*, Sond., but though the structure is similar, that species (judging from the description) is very much larger, resembling in habit *H. serrata*. A few doubtful records occur, which suggest the possibility that the present plant has been collected in Australia, but it certainly does not agree with any species that have been described from that continent.

Perithalia capillaris, *J. Ag.*

Galaxaura *sp. Vide supra.*

This plant is precisely the same as that referred to by Mr. and Mrs. Gepp (*see* note above). It was also found by the "Herald" in 1854.

Pterocladia capillacea, *Born. et Thur.*, Notes Algol., p. 57, tab. 20.

The specimens appear to agree with the European *P. capillacea*, but cystocarps are lacking, hence there is a certain amount of

doubt. The plant was also found by the "Herald" and by Oliver (*see* Gepp. l.c.).

Distr. Apparently general.

Cordylecladia *s.p.*

An interesting specimen, apparently belonging to this genus, was forwarded. The structure is cellular, and the swollen apices of the branches contain cruciate tetraspores. The fronds are 2–3 inches high, rather slender, and but slightly branched. With the exception of Grunow's record of *C. irregularis* Harv., from Fiji (which is doubtful) the genus has not been recorded from the New Zealand region. The material forwarded is hardly sufficient for descriptive purposes.

Plocamium brachiocarpum, *Kütz.* *Vide supra.*

Delisea pulchra, *Mont.* *Vide supra.*

Corallina Cuvieri, *Lamour.* *Vide supra.*

XXXI.—CONTRIBUTIONS TO THE FLORA OF SIAM.

Additamenta, II.

Hebonga siamensis, *Radlk.* [Simarubaceae]; affinis *H. molli,* Radlk., a qua differt foliolis minoribus inaequilateris subfalcatis acuminatis.

Arbor magna, ramis 1·5 cm. crassis apice conico pilis rufis septatis tomentello conferte folia pinnata paniculasque axillares gerentibus. *Folia* 7–9-juga, foliolo terminali parvo deciduo (vel interdum abortivo?), ad 36 cm. longa, petiolo circiter 8 cm. longo adjecto; foliola opposita vel subalterna, ovato-lanceolata, subfalcata, inaequilatera (latere inferiore latiore vix longiore), apice in acumen lineare obtusum protracta, intermedia majora cum petiolulis 5 mm. longis ad 10 cm. longa, 3·5 cm. lata, superiora inferioraque decrescentim minora, subcoriaceo-chartacea, nervis venisque supra impressis insignia, supra praeter nervos puberulos glabra, nitidula, subtus pilis subflavidis molliuscule puberula et papillis nodiformibus ornata, inde opaca, cano-viridula. *Paniculae* pauciramosae, 14–16 cm. longae, ramis 8 cm. longis. *Reliqua* generis (cf. Radlk., Philipp. Journ. Sc., vi. 1911, p. 365) attamen ductibus resinigeris petiolulos quidem, vix vero foliolorum nervos medianos ingredientibus.

Sriracha, Nawng Kaw, 30 m., *Kerr*, 2076 (♂)—"a large tree in evergreen jungle."

Allophylus eustachys, *Radlk.* [Sapindaceae-Thouinieae]; in conspectu *Allophylorum* auctore Radlk. (in Sitzungsber. K. bayer. Ac., xxxviii. 1908, p. 209) post *A. javensem,* Blume (p. 231) inserenda, a quo differt omnium partium hirsutie.

Arbor 7·5 m. alta (ex *Kerr*); rami teretes, 4 mm. crassi, ut et petioli, petioluli thyrsique pilis patulis subfusce hirsuti, cortice pallido lenticelloso-punctato. *Folia* 3-foliolata, 17–28 cm. longa, petiolo robusto teretiusculo supra sulco apice tantum manifesto exarato 17–28 cm. longo adjecto; foliola rhombeo-lanceolata, acuminata, intermedia basi cuneata, lateralia basi valde inaequilatera in petiolulos contracta, intermedia cum petiolulo 1·5 cm. longo 12–18 cm.

longa, 4–6 cm. lata, lateralia paullo minora, petiolulis 5–6 mm. longis, subrepande mucronulato-denticulata, membranacea, nervis utrinque 10–13 sat approximatis procurvis subtus prominulis in mucronulos pilosos excurrentibus, saturate viridia, opaca, supra pilis brevioribus praesertim ad nervos obviis hirtella, subtus pilis longioribus undique crebris subhirsuta margineque ciliata, epidermide valde mucigera. *Thyrsi* axillares, solitarii, simplices, robustiores, stricti, ad 20 cm. longi, rhachi striata hirsuta fere a basi cincinnos glomeruliformes sessiles crebros gerente ; alabastra 1·5 mm. diametro ; flores mediocres, breviter pedicellati. *Sepala* glabriuscula. *Petala* cochleariformia, unguis longo pilosiusculo, squama biloba villosa. *Discus*, *stamina*, *germen* puberula. *Fructus* juvenilis cocci globosi, pilis longiusculis laxe adspersi ; fructus maturus non visus.

Chiengmai, Ban Pong, in mixed jungle by a stream, 330 m., *Kerr*, 1944.

Sapindus? siamensis, *Radlk.* [Sapindaceae-Sapindeae]; ob fructum ignotum dubia, si revera hujus generis affinis *S. tomentoso*, Kurz (sectionis *Dittelasma*), a quo inter alia differt germine tomento denso flavescente-albido induto.

Arbor ramis teretiusculis sulcatis 3–4 mm. crassis griseo-pubescentibus cortice nigro-fusco. *Folia* abrupte pinnata, 3–4-juga, petiolo 4–6 cm. longo adjecto 20–30 cm. longa, rhachi supra bisulcata sordide pubescente in apiculum sterilem subulatum terminata ; foliola 5–7, inferiora subopposita, superiora alterna, elliptico-oblonga, utrinque obtusa vel subacuta, interdum quodammodo inaequilatera, inferiora latere exteriore, superiora latere interiore angustiora brevioraque, cum petiolulis 3–5 mm. longis 10–18 cm. longa, 4–7 cm. lata, integerrima, membranaceo-chartacea, nervis lateralibus utrinque 10–12 sat approximatis oblique erectis venisque reticulatis supra vix subtus sat prominentibus, supra praeter nervos glabriuscula, e livescenti-viridi in subfuscum vergentia, nitidula, subtus molliter pubescentia, pallidiora, opaca, glandulis microscopicis clavatis superficiei subadpressis (nec ut in reliquis *Sapindi* speciebus in foveolas conchiformes impressis) raris adspersa, epidermide paginae superioris e cellulis valde convexis granulato-punctatis inanibus conflata, paginae inferioris stomatum copia insigni. *Panicula* terminalis, 13–18 cm. longa, pauciramosa, rhacheos apice ramisque thyrsoideis dense cymulas (polychasia vel dichasia in cincinnos abeuntia) subsessiles gerentibus, bracteis bracteolisque subulatis pubescentibus. *Flores* unisexuales, 5 mm. longi et lati, oblique symmetrici, ♂ breviter, ♀ longius pedicellati, pedicellis 3–6 mm. longis basi articulatis. *Sepala* 5, breviter oblonga, obtusa, dense albide tomentosa, ciliata, intus subglabra. *Petala* 4 (infimi sede inter sepalum 3 et 5 vacua) sub disci margine inserta, subspatulata, lamina ovato-oblonga obtusiuscula concava dorso puberula intus glabra in unguem lamina paullo breviorem dorso margineque villosum attenuata, supra unguem squamulis 2 deflexis dense villoso-barbatis dorso minutim cristatis aucta. *Discus* (in floris parte superiore ante sepalum 4) unilateralis, inter petalorum insertiones in lobulos tumens, glaber. *Stamina* 8, intra discum circa pistillum vel pistilli rudimentum inserta, filiformia, floris ♂ exserta, floris ♀ breviora, germen vix superantia, sterilia, praeter apicem villosula, antheris breviter ovatis subapiculatis dorso supra basin emarginatam

affixis introrsis glabris. *Germen* (floris ♂ rudimentarium) ad disci marginem inferiorem ante sepalum 3 et 5 insertum, trigono-ovatum, 3-sulcatum, 3-loculare, dense albide tomentosum, in stylum germen aequantem subulato-filiformem sursum curvatum pubescentem apice incrassato-stigmatosum terminatum ; gemmulae in loculis solitariae, prope basin axeos tuberculo insidentes, erectae, apotropae, campylotropae, micropyle extrorsum infera. *Fructus* non visus.

Phre, 156–260 m., *Luang Vanpruk*, 119, 191.

Lao name, Ma fueng pa (ex *Luang Vanpruk*).

Mischocarpus grandis, *Radlk.*, comb. nov. *Pedicellia grandis*, Pierre, Fl. For. Cochin., t. 324 A.

Chiengmai, Doi Sootep, 900 m., *Kerr*, 1823.

Murtonia, *Craib*, gen. nov., inter *Hedysareas* et *Phaseoleas* ponendum ; ad illas fructu, ad has habitu accedit.

Calycis lobi duo posteriores in unum emarginulatum connati, lateralibus infimoque subaequales. *Vexillum* amplum, subrotundatum, basi cuneatum ; alae oblongae, basi sagittatae, unguiculatae ; carina obtusa, unguiculata. *Stamen* vexillare liberum, ceteris connatis. *Ovarium* lineare, multi-ovulatum, stylo glabro, stigmate parvo terminali capitato. *Legumen* exsertum, articulatum, seminibus plerumque 7–9, stipitatum vel ob semina infima abortiva longe stipitatum.—*Suffrutex* scandens, partibus fere omnibus (floribus exceptis) pilis albidis brevibus uncinatis rigidiusculis instructus. *Folia* imparipinnata, stipulis conspicuis rigidis ; foliola opposita, penninervia, stipellata. *Inflorescentia* axillaris, ample simpliciter paniculata.

Species *unica*.

Murtonia Kerrii, *Craib*, sp. n.

Suffrutex scandens ; ramuli primo pilis uncinatis albidis brevibus rigidiusculis instructi, mox glabri vel fere glabri, virides, interdum brunneo-maculati, teretes. *Folia* imparipinnata, petiolo 3–7 cm. longo pilis iis ramulorum similibus instructo suffulta ; stipulae ovatae, apice acuminatae, pungentes, basi auriculatae, circiter 1·7 cm. longae et 9 mm. latae, saepissime reflexae, virides, striatae, dorso breviter hirsutulae ; foliola 5, terminali a lateralibus 1·5–2·5 cm. distante, lateralibus oppositis paribus inter se 3–4·5 cm. distantibus, lanceolata vel late lanceolata, apice acuminata, acuta, basi rotundata, subcordata, 5·5–16 cm. longa, 1·3–4·4 cm. lata, rigide chartacea vel fere subcoriacea, nervis lateralibus utrinque 16–18 obliquis intra marginem anastomosantibus supra conspicuis vel fere prominulis subtus prominentibus, nervis transversis subtus prominentibus, supra matura glabra nisi costa basin versus pilis paucis uncinatis instructa, subtus pallidiora, costa nervisque pilis parvis uncinatis instructa, margine cartilagineo crispato ; rhachis pilis iis ramulorum similibus instructa ; petioluli breves, validiusculi, albohirsuti, supra canaliculati ; stipellae rigidae, lineari-lanceolatae, pungentes, ad 1 cm. longae, 1·5 mm. latae, subglabrae, nervatae. *Inflorescentia* axillaris, simpliciter paniculata, pedunculo 6–15 cm. longo inferne indistincte angulato angulis praecipue pilis uncinatis albidis instructo suffulta ; flores solitarii vel gemini ; bracteae lanceolatae vel ovato-lanceolatae, acutae, 2·5 mm. longae, 0·75 mm. latae, rigidiusculae, costatae, ciliatae ; pedicelli teretes, 1·5 mm. longi. *Calyx* 3·5 mm. longus ; lobi inter se longitudine subaequales, posteriores in unum late deltoideum emarginulatum connati, laterales

infimusque anguste deltoidei, acuti. *Vexillum* subrotundatum, 8 mm. diametro, basi cuneatum ; alae oblongae, basi obtuse sagittatae, 7·5 mm. longae, ungui gracili 1·5 mm. longo suffultae, medio carinae adhaerentes ; carina obtusa, 7 mm. longa, ungui 2 mm. longo suffulta. *Stamen* vexillare liberum. *Ovarium* multi-ovulatum, lineare, 7 mm. longum ; stylus circiter 2 mm. longus, stigmate capitato terminali. *Legumen* compressum, ad 4·5 cm. longum, 4·5 mm. latum, ad 9-articulatum, stipitatum vel saepe ob semina inferiora abortiva longe pseudo-stipitatum, pilis iis ramulorum similibus tectum.

Cultivated at Chiengmai from seed collected at Lakon Lumpang, in mixed jungle, 360 m., *Kerr*, 1534,—"standard white, keel and wings purple."

Afzelia xylocarpa, *Craib*, comb. nov. *A. siamica*, Craib, Kew Bull. 1911, p. 47. *Pahudia xylocarpa*, Kurz, For. Fl. Burma, i. p. 413.

Chiengmai, by streams on Doi Sootep, 330 m., *Kerr*, 1068 ; Siam, *Teysmann* ; ? Korat, *Witt*, 1.

Distr. Upper Burma : Shan Hills, *Abdul Huk*, 134.

Siamese name, Mai Makha Yai (ex *Witt*).

Styrax benzoides, *Craib* [Styracaceae]; a *S. benzoin*, Dryand., fructibus multo minoribus, pericarpio multo tenuiore in valvas tres regulariter dehiscente, a *S. suberifolio*, Hook. et Arn., floribus fructibusque minoribus, ab ambobus indumento tenuiore recedit.

Arbor parva vel mediocris (ex *Kerr*) ; ramuli graciles, primo stellato-tomentelli, mox glabri, cortice rubro-brunneo vel pallide brunneo irregulariter longitudinaliter fisso obtecti. *Folia* ovato-lanceolata apice acuminata, acuta, basi cuneata vel late cuneata, rarissime cuneato-rotundata, 7–15 cm. longa, 3·6–5·7 cm. lata, rigide chartacea, supra glabra, subtus nisi nervis parce stellato pubescentibus dense breviter tomentella, nervis lateralibus utrinque circiter 9 obliquis intra marginem anastomosantibus supra conspicuis subtus prominentibus, petiolis 1–1·2 cm. longis indumento ut foliorum pagina inferiore suffulta. *Inflorescentia* e paniculis duobus racemiformibus axillaribus superpositis superiore ad 5 cm. longa inferiore dimidio breviore constituta ; rhachis breviter stellato-tomentella ; bracteae fugaces ; bracteolae deciduae, vix 2 mm. longae ; pedicelli circiter 4 mm. longi, indumento ut calyce corollaque extra et foliorum pagina inferiore. *Calyx* truncatus, 3·5 mm. altus, intra superne tenuiter sericeus. *Corollae* albae (ex *Kerr*), tubus 2 mm. longus, lobi late lineares, 9 mm. longi, 1·75 mm. lati, intra superne subsericei, inferne parcissime adpresse albo-pubescentes. *Filamenta* 2·5 mm. longa, breviter albo-pilosa ; antherae 3·5 mm. longae. *Ovarium* circiter 2 mm. altum, adpresse albo-pubescens ; stylus 1·2 cm. longus, glaber. *Fructus* ad 1 cm. altus, pericarpio extra cinereo-tomentello corrugato 0·5 mm. crasso in valvas tres regulariter dehiscente.—*S. Benzoin*, Craib, Kew Bull. 1911, p. 409, *non* Dryand.

Chiengmai, in evergreen jungle on Doi Sootep, 1050–1350 m., *Kerr*, 669 ; in evergreen jungle, 600–1200 m., *Kerr*, 669*b*.

Lao name, Kŭm Yan (ex *Kerr*).

Strobilanthes Kerrii, *Craib* [Acanthaceae-Ruelieae]; a *S. multidente*, C. B. Clarke, foliis brevius obtuse acuminatis crenato-serratis vel obsolete crenato-serratis recedit.

Suffrutex circiter 9 dm. altus; caules crispatim pubescentes, demum puberuli. *Folia* ovato-lanceolata vel elliptica, inaequilatera, apice acuminata, obtusa, basi latere altero rotundato altero cuneato, conspicue inaequalia, majora 5·5–16 cm. longa, 2·5–8·3 cm. lata, minora saepe decidua, ad 4·5 cm. longa, chartacea, supra lineolata, costa nervisque adpresse crispatim pubescentia, subtus pallidiora, molliter pubescentia, crenato-serrata vel obsolete crenato-serrata, nervis lateralibus utrinque ad 7 supra conspicuis subtus prominulis, nervis transversis satis distantibus pagina utraque conspicuis; petioli foliorum majorum ad fere 2 cm. longi, minorum circiter 5–7 mm. longi, crispatim pubescentes. *Spicae* capituliformes, axillares, longius pedunculatae; bracteae ovatae vel oblongae, 0·5–1·1 cm. longae, 3·5–4·5 mm. latae, extra et apicem versus intra hirsutae; bracteolae lineari-oblanceolatae, acutiusculae, 7 mm. longae, 1·5 mm. latae. *Sepala* 5, subaequalia, lineari-oblanceolata, obtusiuscula, circiter 1 cm. longa et 1·75 mm. lata, superne dense subferrugineo-glanduloso-pilosa. *Corolla* purpurea (ex *Kerr*), 4·7 cm. longa, parte basali aequali circiter 1·7 cm. longa et 1·5 mm. diametro, parte expansa 1·2 cm. diametro, lobis oblongis. *Stamina* 4. *Ovarium* 2 mm. altum, apice glandulosum; stylus inferne parce glanduloso-pubescens.

Phre, Hue Kamin, by streams, 300 m., *Kerr*, 988.

Strobilanthes (Buteraea) rubro-glandulosus, *Craib* [Acanthaceae-Ruellieae]; a *S. acuminato*, Wall., foliis ovatis vel ovato-lanceolatis crasse irregulariter crenatis recedit.

Suffrutex sarmentosus; caules parce rubro-glandulosi, minute crispato-puberuli, mox subglabri. *Folia* opposita subaequalia vel distincte inaequalia, ovata vel ovato-lanceolata, apice acuminata, obtusa, basi cuneata, 4·5–10 cm. longa, 2·5–5 cm. lata, crasse irregulariter crenata, tenuiter chartacea, supra glabra, lineolata, subtus pallida, glandulis rubris sessilibus ornata, costa nervisque crispato-puberula, nervis lateralibus utrinque 5–6 supra conspicuis subtus prominentibus, nervis transversis supra subobscuris subtus subprominulis; petioli foliorum oppositorum parum inaequales, 0·5–1·5 cm. longi, crispatim puberuli. *Spicae* et axillares et terminales, saepe in paniculam terminalem dispositae, longius pedunculatae, ad 5 cm. longae; bracteae oblongo-cuneatae, parum retusae, 8·5 mm. longae, 3 mm. latae, pilis longis glandulosis hic illic instructae; bracteolae bracteis similes sed minores. *Calyx* bilabiatus; labium anticum e segmentis duobus fere e basi liberis spatulatis retusulis 10·5 mm. longis circiter 2 mm. latis ciliolatis constitutum, posticum 3-lobatum, 9 mm. longum. *Corolla* purpurea (ex *Kerr*), 3 cm. longa. *Capsula* vix 1 cm. longa; semina orbicularia, compressa, 1·25 mm. diametro, pilis hygroscopicis vestita.

Between Lakon and Phre, near Ban Meh Tah, by streams, 300 m., *Kerr*, 995.

Justicia chlorantha, *Craib* [Acanthaceae-Justicieae]; ab affini *J. flaccida*, Kurz, petiolis haud alatis, inflorescentia spiciformi plerumque simplice facile distinguenda.

Caules circiter 6 dm. alti, basi lignosi, primo unilateraliter pubescentes, mox glabri, subvirides, striati. *Folia* late ovata, ovato-oblonga vel ovato-lanceolata, apice acuminata, obtusiuscula, basi

rotundata, vel fere truncato-cuneata, 10–21·5 cm. longa, 5·7–10·5 cm. lata, membranacea, utrinque fere glabra, supra sicco viridia, subtus pallidiora, nervis lateralibus utrinque 9–10 supra conspicuis subtus prominentibus, nervis transversis pagina utraque conspicuis ; petioli foliorum oppositorum parum inaequales, ad 6·5 cm. longi, supra canaliculati et pilis crispis brunneis in lineas duas dispositis instructi. *Cymae* oppositae, in racemum terminalem spiciformem plerumque simplicem 10–17 cm. longum internodiis infimis 3 cm. longis dispositae ; pedunculus communis circiter 4 cm. longus, ut rhachis unilateraliter crispatim pubescens ; bracteae bracteolaeque parvae. *Calyx* 2 mm. longus, lobis 5 acutis ciliolatis. *Corolla* viridis (ex *Kerr*), 5·5 mm. longa ; labium posticum erectum, emarginatum, anticum 3-lobatum. *Stamina* subinclusa. *Capsula* oblonga, circiter 1 cm. longa, inferne in stipitem contracta, parce pubescens. *Semina* depresso-globosa, circiter 2 mm. diametro, verrucosa.

Meh Ping Rapids, Ban Kaw, in mixed jungle, *Kerr*, 2023.

Justicia decumbens, *Craib* [Acanthaceae-Justicieae] ; ab *J. flaccida*, Kurz, petiolis haud vel vix alatis facile distinguenda.

Caules decumbentes, nodis inferioribus radicantes, primo bifaciaiter pubescentes, mox glabri. *Folia* elliptica vel ovato-lanceolata, apice acuminata, obtusa, basi attenuata, 6–18 cm. longa, 2–6·5 cm. lata, membranacea, utrinque fere glabra, supra lineolata, subtus pallidiora, nervis lateralibus utrinque circiter 8 supra conspicuis subtus prominulis, nervis transversis utrinque conspicuis, petiolis ad 4 cm. longis supra canaliculatis parce pubescentibus suffulta. *Panicula* terminalis, ei *J. flaccidae* similis ; bracteae bracteolaeque parvae. *Calyx* 2 mm. longus, lobis lineari-lanceolatis acutis ciliolatis. *Corolla* alba nisi labio antico purpureo-picto (ex *Kerr*), 1·5 cm. longa ; labium posticum erectum, anticum breviter 3-lobatum. *Stamina* 2, subinclusa.

Chiengmai, Doi Kum, by stream, 330 m., *Kerr*, 1658.

Amorphophallus corrugatus, *N. E. Brown* [Aroideae-Pythonieae] ; affinis *A. Kerrii*, N. E. Brown, sed ovariis atropurpureis, stylis longioribus, appendice valde corrugata facile distinguitur.

Herba tuberosa, perennis. *Folium* ignotum. *Pedunculus* 25–55 cm. longus, ad 1 cm. crassus, sordide viridis et albido-variegatus et fusco-punctatus. *Spatha* erecta, 7–15 cm. longa, 3–7 cm. lata, cucullata, apice leviter procurva, obtusa, basi brevissime convoluta, marginibus leviter undulatis, glabra, extra viridis versus basin albido-variegata, marginibus purpureo-tinctis, intra albida, apice viridis, marginibus purpureis. *Spadix* spatha multo brevior, stipitata ; stipes albus ; pars feminea 1·5–3 cm. longa, ad 1·8 cm. crassa, cylindrica, fusco-purpurea ; ovarium globosum, in stylum 2–3 mm. longum abrupte contractum, stigmate punctiformi ; pars mascula 1·5–2 cm. longa, ad 1·4 cm. crassa, cylindrica, roseo-tincta vel carnea ; appendix 1·5–3 cm. longa, ad 2 cm. crassa, irregulariter ovoidea, obtusa, profunde corrugata, sordide ochracea.

Chiengmai, Doi Sootep, 1500 m., *Kerr*, 1105.

Described from a living plant sent by Dr. A. F. G. Kerr to Trinity College Botanic Garden, Dublin, where it flowered in April, 1912.

XXXII.—DIAGNOSES AFRICANAE, XLIX.

1361. **Amphithalea Bodkinii**, *Dümmer* [Leguminosae-Genisteae]; ab *A. densa*, Ecklon et Zeyher, foliis brevioribus valde latioribus vix acutis, floribus fere duplo minoribus distinguitur.

Frutex decumbens? undique corollis exceptis dense argenteo-sericeus, caulibus ad 35 cm. longis teretibus basi 4 mm. crassis; ramuli laterales conferti, brevissimi vel ad 5 cm. longi, dense foliosi. *Folia* imbricata, late ovata vel elliptica, brevissime cuspidata aut fusco-mucronata, basi rotundata vel paullulo angustata, 6–9 mm. longa, 5–8 mm. lata, valde coriacea, dorso costa prominente sed nervis lateralibus obsoletis. *Flores* singuli in axillis foliorum superiorum dispositi et ea excedentes, brevissime pedicellati, sicco rosei; bracteae subulatae, tubo triplo aut quadruplo breviores. *Calyx* extra pubescens, 5 mm. longus, lobis anguste triangularibus tubo vix aequalibus. *Corolla* glabra; vexillum unguiculatum, 8–9 mm. longum, 4 mm. latum, lamina late obovata emarginata basi auriculata, ungue anguste cuneato lamina duplo breviore; alae graciliter unguiculatae, 8–9 mm. longae, 2 mm. latae, limbis suboblongis rotundatis subauriculatis; carinae lamina anguste falcato-oblonga, rotundata, auriculata; ungues 2 mm. longi. *Pistillum* villosulum, apicem versus glabrum, stigmate truncato.

South Africa. Coast Region: Paarl Div.; on the mountains about French Hoek, 960 m., *Bodkin in Herb. Bolus*, 8622.

1362. **Coelidium amphithaleoides**, *Dümmer* [Leguminosae-Genisteae]; *C. muraltioidi*, Bentham, affine sed foliis arrectis brevioribus haud tortuosis dorso fere carinatis, spicis longioribus magis cylindricis facile distinguendum.

Fruticulus ad 40 cm. altus, habitu *Amphithaleae ericaefoliae*, Ecklon et Zeyher, sed laxiuscule ramosus et minus foliosus; rami graciliter arcuati, angulati, juventute foliis obtecti, albo-villosuli. *Folia* arrecta, subimbricata, ericoidea, lanceolata, obtusa, 3 mm. vix excedentia, dorso fere carinata, mox glabra lucidaque, intra concava, dense pubescentia. *Spicae* terminales, cylindricae, 1–2·5 cm. longae, floribus purpureis bracteas foliaceas ovatas valde excedentibus. *Calyx* extra pubescens, 5–6 mm. longus, dentibus deltoideis tubo duplo brevioribus. *Corolla* glabra; vexillum breviter unguiculatum, 5–6 mm. longum, lamina fere quadrata; alae graciliter unguiculatae, 6–6·5 mm. longae, laminis oblongis rotundatis basi truncatis, carina alis simili sed auriculata. *Stylus* rectus, filiformis, glaber, stigmate oblique truncato.

South Africa. Central Region: Ceres Div.; on stony slopes at Gydouw Pass, 840 m., *Bolus*, 7346 and 1040.

A remarkably distinct species with the aspect of *Amphithalea ericaefolia*, Ecklon and Zeyher.

1363. **Coelidium euchaetioides**, *Dümmer* [Leguminosae-Genisteae]; *C. Bowiei*, Bentham, affine sed foliis brevioribus carnosulis subteretibus obtusis haud pungentibus, calycibus pubescentibus distinctum.

Fruticulus ericoideus; rami angulati, primo pubescentes, mox glabri castaneique; ramuli florentes laterales brevissimi vel ad 3 cm. longi, foliis obtecti. *Folia* saepe subimbricata, arcuato-ascendentia, teretiuscula, carnosula, supra profunde canaliculata, obtusa, 4–4·5 mm.

longa, mox praeter sulcam glabra. *Flores* brevissime pedicellati, solitarii vel in capitula terminalia 2–6-flora congesti; bracteae ovatae, parvulae, pubescentes. *Calyx* extra pubescens, lobis triangularibus obtusis tubum aequantibus. *Corolla* glabra; vexillum cuneatum, rotundatum, 8 mm. altum, 4·5 mm. latum; alae graciliter unguiculatae, 6–7 cm. longae, limbis suboblongis rotundatis basi truncatis; carina alis similis, auriculis ornata. *Ovarium* subsericeum, uniovulatum, stylo recto glabro longiusculo; stigma simplex.

South Africa. Coast Region: Clanwilliam Div.; on the Cederberg Range near Clanwilliam, *Bodkin in Herb. Bolus*, 8966.

The specific name implies the close resemblance this species bears to *Euchaetis ericoides*, Dümmer.

1364. **Argyrolobium aciculare**, *Dümmer* [Leguminosae-Genisteae]; *A. filiformi*, Ecklon et Zeyher, affinis sed glabrior et floribus duplo minoribus.

Radix tuberosa (fide *Bolus*); *caules* annui, florentes stricti aut subflexuosi, interdum simplices, gracillimi, laxe foliati, teretes, ad 15 cm. alti. *Folia* ascendentia, trifoliolata; petioli teretiusculi, ad 7 mm. longi; foliola filiformi-acicularia, pungentia, supra profunde sulcata, subsericea, mox glabrescentia, ochraceo-viridia, inter se aequilonga vel terminalia caeteris paullulo longiora, ad 4 cm. longa; stipulae geminae, arrectae, subulatae, 2 mm. vix excedentes. *Inflorescentia* axillaris vel terminalis, uniflora vel saepius umbellatim 3–5-flora, pedunculis nudis ad 1·3 cm. longis; bracteae bracteolaeque arrectae, subulatae, 2·5–3 mm. longae. *Calyx* cum pedicello circiter 1 cm. longus, argenteo-sericeus. *Vexillum* late subcuneatum, rotundatum, inferne margine involutum, 8 mm. longum, 5 mm. latum, postice superne subsericeum; unguis fere obsoletus; alae rectae, oblongae, rotundatae, basi truncatae, 5 mm. longae, 2 mm. latae; ungues circiter 1 mm. longi; carina alis similis, sed paullulo brevior et magis curvata, glabra. *Ovarium* ad suturam ventralem et apicem versus sericeum, stylo valde arcuato glabro ovario duplo breviore, stigmate subcapitato.

South Africa. Coast Region: Caledon Div.; on the slopes of a mountain at Houw Hoek, 300–690 m., *Bolus*, 6934.

1365. **Argyrolobium Muddii**, *Dümmer* [Leguminosae-Genisteae]; a *A. transvaalensi*, Schinz, foliolis ellipticis, floribus majusculis distinguitur.

Herba lignosa, ad 40 cm. alta, parce ramosa, ramis subfastigiatis laxe foliatis teretiusculis fusco-sericeis. *Folia* trifoliolata; petioli 2–4 mm. longi; foliola internodiis aequilonga vel duplo breviora, elliptica, apiculata aut obtusa, supra mox fere glabra, subtus fusco-sericea et costa prominula, subcoriacea, inter se aequilonga aut terminalia caeteris paullo longiora, circiter 2·5 cm. longa, 0·8–1·2 cm. lata; stipulae binae, arrectae, subulatae, petiolos fere aequantes. *Racemi* terminales, pauci, recti, 5–7-flori, pedunculis inferne fere nudis ad 9 cm. longis; bracteae subulatae, pedicellos fere aequantes aut iis breviores; bracteolae nullae vel minutissimae. *Flores* aurantiaci (fide *Mudd*), pedicellis ad 8 mm. longis et cum calycibus fulvo-sericeis. *Calycis* labium inferius circiter 1 cm. longum. *Corolla* glabra; vexillum brevissime unguiculatum, lamina ampla reflexa fere orbiculari 1·3–1·5 cm. diametro; alae oblique late-oblongae,

rotundatae, 1 cm. longae, 5–6 mm. latae ; ungues brevissimi ; carina navicularis, obtusa, basi auriculata, 6 mm. longa, 5 mm. lata. *Ovarium* hirsutulum, stylo arcuato ovarium fere aequante.

South Africa. Kalahari Region : Transvaal ; summit of Mount MacMac, *Mudd*.

1366. **Argyrolobium natalense**, *Dümmer* [Leguminosae-Genisteae] ; *A. longifolio*, Walpers, peraffine, sed glabrescens et racemis gracilioribus.

Frutex gracilis, circiter metralis, laxe distiche ramosus, in sicco nigrescens, ramis lateralibus ascendentibus teretibus sulcatis superne laxe foliatis mox glabris. *Folia* trifoliolata ; petioli circiter 1 cm. longi ; foliola saepissime conduplicata, lineari-lanceolata, acuminata aut acutata, terminalia ad 4·5 cm. longa, 4–5 mm. lata, lateralia caeteris paullo breviora, fere glabra, subcoriacea ; stipulae solitariae, subulatae, 2 mm. vix excedentes, deciduae. *Racemi* terminales, plurimi, ascendentes, interdum secundi, graciliter 5–12-flori, floribus patentibus brevissime pedicellatis flavidis ; bracteae subulatae, pedicellos aequantes ; bracteolae subulatae, ad 2 mm. longae. *Calyx* extra subsericeus, mox glaber, 5–7 mm. longus. *Vexillum* 8–9 mm. longum, 7–8 mm. latum, rotundatum, emarginatum, a medio in unguem sensim angustatum, postice circa costam fulvido-sericeum ; alae brevissime unguiculatae, 8 mm. longae, fere glabrae, limbis suboblongis rotundatis basin versus paullulo angustatis auriculatis ; carinae lamina navicularis, acutata, 6 mm. longa, 3 mm. lata, glabra ; ungues 2 mm. longi. *Legumen* lineari-oblongum, fere rectum, complanatum, 5–6 cm. longum, 3 mm. latum, subsericeum, 12–15-spermum, seminibus brunneis.

South Africa. Eastern Region : Natal ; Itafamasi, Inanda, *Wood*, 861.

A species with the facies of *A. longifolia*, Walpers, but easily distinguished by its glabrescent character and more slender racemes.

A specimen collected by *Wood* (3847) near Northdene agrees with *A. longifolia*, Walpers.

1367. **Argyrolobium nigrescens**, *Dümmer* [Leguminosae-Genisteae] ; *A. tuberoso*, Ecklon et Zeyher, remote affinis, sed foliolis brevioribus, floribus oppositifoliis solitariis recedit.

Herba rhizomate lignescente perennans, sicco nigrescens, caulibus annuis florentibus decumbentibus aut strictis gracilibus parce foliatis 12 cm. vix excedentibus sericeis inferne nudis. *Folia* erecta, trifoliolata, brevissime petiolata, internodiis saepissime breviora ; foliola lineari-lanceolata, acuminata, inter se aequilonga vel terminalia caeteris longiora, 2–5·5 cm. longa, 2–3 mm. lata, supra mox glabra, subtus griseo-sericea, subcoriacea, costa prominula ; stipulae geminatae, falcato-subulatae, circiter 5 mm. longae. *Flores* solitarii, oppositifolii, flavidi (fide *Wood* et *Sankey*), pedunculis ad 5 mm. longis ; bracteae filiformes, 2 mm. longae. *Calyx* circiter 8 mm. longus, extra villosulus. *Vexillum* brevissime unguiculatum, lamina orbiculari ad 1 cm. diametro dorso superne subsericea ; alae suboblongae, rotundatae, vix auriculatae, in toto 8 mm. longae, 3 mm. latae ; ungues perbreves ; carinae lamina oblique navicularis, obtusa, basi truncata, 6 mm. longa, 3–4 mm. lata, glabra ; ungues 2 mm. longi. *Ovarium* ad suturam ventralem et apicem versus hirsutulum, stylo erecto glabro, stigmate capitato.

South Africa. Kalahari Region: Orange River Colony; Harrismith, *Sankey*, 56. Basutoland, *Cooper*, 2179. Eastern Region: Natal; Van Reenen's Pass, 1500–1800 m. *Wood*, 4517.

1368. **Argyrolobium podalyrioides**, *Dümmer* [Leguminosae-Genisteae]; *A. collino*, Ecklon et Zeyher, peraffinis, sed foliolis multo latioribus fere truncatis, floribus majusculis distincta.

Planta perennis, undique corollis exceptis valde argenteo-sericea; *caules* annui, stricti, fere simplices, lignescentes, graciliusculi, parce foliosi, ad 30 cm. alti. *Folia* erecta, trifoliolata, saepe internodiis breviora; petioli perbreves vel ad 8 mm. longi; foliola late cuneata, truncata et brevissime cuspidata vel brevissime rotundato-cuspidata, terminalia 1–1·5 cm. longa, 0·8–1·2 cm. lata, caeteris paullo brevioribus vel interdum aequilongis, subtus obsolete costata, coriacea; stipulae binae, arrectae aut patentes, deltoideae, minutissimae. *Flores* singuli, oppositifolii, brevissime pedicellati vel in umbellas terminales 2–3-floras aggregati, bracteis subulatis. *Calyx* extra argenteo-sericeus, circiter 1 cm. longus. *Vexillum* brevissime unguiculatum, late cuneatum, rotundatum, 1·3 cm. longum, 1·2–1·3 cm. latum, postice sericeum; alae oblongae, rotundatae, auriculatae, 1 cm. longae, 4 mm. latae, glabrae; ungues 1·5 mm. longi; carina navicularis, obtusa, 8–9 mm. longa, 4–4·5 mm. lata, basi truncata, glabra. *Ovarium* sericeum, stylo arcuato glabro.

South Africa. Coast Region: Albany Div.; on grassy hills near Grahamstown, 600 m. *MacOwan*, 481. Bothas Berg, 660 m. *MacOwan*, 481. Grahamstown, *Tyson*.

1369. **Argyrolobium rarum**, *Dümmer* [Leguminosae-Genisteae]; *A. Harveiano*, Oliver, affine, sed humilius, petiolis longioribus, foliolis brevioribus anguste ellipticis differt.

Herba annua? erecta, inferne ramosa, circiter 11 cm. alta, ramis graciliusculis simplicibus ascendentibus parce fulvido-sericeis. *Folia* ascendentia, trifoliolata, internodiis breviora aut longiora; petioli 0·8–1·2 cm. longi, supra canaliculati; foliola anguste elliptica, utrinque angustata, acuta, supra mox glabra, subtus parce sericea, costa fere obsoleta, vix coriacea, terminalia ad 1·7 cm. longa, 2 mm. lata, lateralia paullo breviora; stipulae binae, arrectae, subulatae, petiolis duplo aut quadruplo breviores. *Flores* singuli vel bini, oppositifolii, flavidi, pedicellis ad 8 mm. longis, bracteis lanceolatis pedicellis duplo brevioribus. *Calyx* extra subsericeus, ad 7 mm. longus, laciniis lanceolatis acuminatis. *Corolla* glabra; vexillum brevissime unguiculatum, in toto 1 cm. altum, lamina late triangulari acutata inferne rotundata; alarum ungues graciles, 3 mm. longi; limbi naviculares, obtusi, basi truncati, 6 mm. longi, 3 mm. lati; carina alis similis sed minor angustiorque, auriculis parvulis ornata. *Ovarium* suturis sericeis, stylo valde arcuato glabro ovarii longitudinem excedente, stigmate horizontaliter subcapitato.

South Africa. Coast region: Albany Div.; Grahamstown, Hell Poort, *MacOwan*, 940 (or 946 ?).

1370. **Argyrolobium Sankeyi**, *Dümmer* [Leguminosae-Genisteae]; ab *A. stipulaceo*, Ecklon et Zeyher, foliolis ellipticis haud sericeo-nitidis, stipulis parvulis distinguitur.

Planta perennis, e basi lignescente ramosa, ramis florentibus ascendentibus dense foliosis ad 15 cm. altis valde villosulis. *Folia*

ascendentia, trifoliolata ; petioli supra profunde sulcati, ad 5 mm. longi ; foliola elliptica vel late-elliptica, utrinque acutata, terminalia 1·5–1·7 cm. longa, 0·9–1·3 cm. lata, lateralia paullo breviora, utrinque albo-villosulo-sericea, subtus costa prominente, subcoriacea, viridia, margine creberrime et breviter ciliata ; stipulae binae, falcato-lanceolato-subulatae, petiolos fere aequantes. *Inflorescentia* solitaria, pedunculata, 3–5-flora floribus flavidis umbellatim aggregatis ; pedunculus 0·8–2 cm. longus, villosulus ; pedicelli perbreves ; bracteae stipulis similes sed breviores. *Calyx* 1–1·2 cm. longus, extra hirtellus. *Vexillum* brevissime unguiculatum, lamina fere rotundata circiter 1·2–1·3 cm. diametro dorso valde costata et sericea ; alae rectae, oblongae, rotundatae, truncatae aut obtusae, 1 cm. longae, 4 mm. latae, frontem versus subsericeae, unguibus perbrevibus ; carinae limbus late navicularis, obtusus, apicem versus paullulo barbatus. *Stylus* valde arcuatus, ovarium subaequans. *Legumen* immaturum, rectum, lineare-oblongum, compressum, villosulum, 3 cm. longum.

South Africa. Kalahari Region : Orange River Colony ; Harrismith, *Sankey*, 43.

1371. **Argyrolobium Woodii**, *Dümmer* [Leguminosae-Genisteae] ; facie *A. nigrescentis*, Dümmer, sed caulibus altioribus, stipulis majusculis, inflorescentiis racemose 3-floris, floribus purpureis.

Caules florentes annui, fere stricti, simplices, ad 30 cm. alti, villosuli. *Folia* erecta, trifoliolata, internodiis saepe duplo longiora ; foliola saepissime conduplicata, lineari-lanceolata, acuminata, terminalia, ad 4 cm. longa, 3 mm. lata, caeteris longiora, utrinque sericeo-villosula, dorso costata, coriacea ; petioli circiter 5 mm. longi, villosuli ; stipulae geminatae, arrectae, lanceolatae, cuspidato-acuminatae, ad 2 cm. longae. *Racemi* terminales, solitarii, 3-flori ; pedunculi 3 cm. longi, villosuli. *Flores* breviter pedicellati, purpurei (fide *Wood*), bracteis subulatis villosulis ad 6 mm. longis. *Calyx* extra villosulus, circiter 1 cm. longus, laciniis superioribus lanceolatis cuspidato-acuminatis. *Vexillum* brevissime unguiculatum, limbo reniformi-orbiculari 1 cm. lato postice ad costam et superne sericeo ; alae anguste longitudinaliter obovatae, basin versus angustatae et auriculis ornatae, 9 mm. longae, glabrae ; ungues vix 1 mm. longi ; carina brevissime unguiculata, tota 7 mm. longa, apicem versus ampliata, 3·5–4 mm. lata et pilos paucos gerens, basin versus abrupte attenuata, vix auriculata. *Stylus* fere geniculatus, glaber, ovario hirsuto brevior, stigmate oblique subcapitato.

South Africa. Eastern Region : Natal ; Liddesdale, 1200–1500 m., *Wood*, 3937.

1372. **Indigofera setosa**, *N. E. Brown* [Leguminosae-Indigoferae] ; affinis *I. heterotrichae*, DC., sed foliis mucronatis, racemis brevioribus et floribus paucioribus facile distinguitur.

Herba 30–60 cm. alta. *Caules* erecti, ramosi, basi lignosi, dense setulosi ; setulae patulae, subflaccidae, apice minute glanduliferae. *Folia* 1–2 cm. longa, brevissime petiolata, imparipinnata ; foliola opposita, 2–3-juga, 0·4–1·2 cm. longa, 1·5–4·5 mm. lata, oblonga, utrinque acuta vel obtusa, apice mucronata, utrinque pilis adpressis medio affixis parce pubescentia, rhachi in costa infra et interdum marginibus plus minusve setulosa. *Stipulae* subulatae, 1·5–6 mm. longae. *Racemi* axillares, pedunculati, 3–6-flori ; pedunculi 1–2·5 cm. longi, setulosi ; partes floriferae 4–6 mm. longae. *Bracteae*

subulatae. *Pedicelli* brevissimi, subglabri. *Calyx* profunde 5-lobus, setulosus; tubus vix 1 mm. longus; lobi 3 mm. longi, subulati. *Corolla* 4 mm. longa; vexillum orbiculari-ovatum, breviter unguiculatum, dorso pilis adpressis medio affixis minute pubescens; alae oblique subspathulato-obovatae, obtusae, glabrae; carina acuta, apice parce puberula. *Legumen* lineare, pilis minutissimis medio affixis adpresse puberulum et plus minus setulosum.

South Africa. Natal; on a grassy hill at Umhloti, *Wood*, 1602.

This species is also allied to that which in the Flora Capensis, vol. ii, p. 196, is described under the name *I. seticulosa*, Harv., which I take this opportunity of pointing out should be altogether erased from the South African Flora. For *I. seticulosa* was founded upon a specimen collected by Armstrong and doubtfully localised as being from the Cape of Good Hope. But I find it is identical with *I. viscosa*, Lam., an Australian species, under which *I. seticulosa*, Harv. must rank as a synonym, the type specimen being identical with Armstrong's No. 385, collected at Port Essington, and doubtless belongs to that gathering.

1373. **Crassula densa**, *N. E. Brown* [Crassulaceae]; species distinctissima, affinitate dubia.

Herba succulenta, 4–6 cm. alta, dense ramosa. *Folia* ad apicem ramorum conferta, 6–8 mm. longa, 4–8 mm. lata, 3–7 mm. crassa, basi connata, ovoideo-subtrigona vel elliptico-subtrigona, obtusa vel subacuta, supra leviter convexa, subtus valde convexa et subcarinata, viridia, minute albido-subtuberculata, tuberculis minutissime pruinato-papillosis. *Pedunculus* terminalis, 3 cm. longus, gracilis, minutissime pruinoso-puberulus, bractearum minutarum paribus duobus distantibus instructus. *Flores* sessiles, parvi, in cymam capituliformem 1 cm. diametro congesti. *Calyx* 2 mm. longus, puberulus; lobi 1·5 mm. longi, subulato-lanceolati, acuti. *Corolla* 2·5 mm. longa, gamopetala, infra medium 5-loba, alba; lobi 1·8 mm. longi, oblongi, apice obtusi, plani, recurvi. *Stamina* inclusa; filamenta alba; antherae rubrae, polline luteo. *Squamae hypogynae* late obcuneatae, truncatae vel emarginatae, luteae. *Carpella* staminibus subduplo breviora, pallide viridia; stigma sessile, intense rubrum.

South Africa. Collected during the Percy Sladen Expedition to the Orange River in 1910 by *Prof. Pearson*, No. 6151.

Described from a living plant which flowered at Kew, December 6th, 1911. When dried the largest leaves shrink to the dimensions of about 5 mm. long and 2·5 mm. broad, and become elliptic, elliptic-obovate or suborbicular.

1374. **Crassula inamoena**, *N. E. Brown* [Crassulaceae]; affinis *C. paniculatae*, Dietr., sed foliis angustioribus subdistichis basi supra carinatis et eciliatis facile distinguitur.

Herba succulenta, subacaulis, caespitoso-ramosa. *Folia* radicalia 6–8, opposita, oblique subdistiche rosulata, conferta, recurvato-patula, carnosa, subflaccida, 4–8 (in cultura usque ad 10) cm. longa, 1–1·5 cm. lata, 5–8 mm. crassa, late linearia vel subattenuata, obtusa vel acuta, supra infra medium plana leviter medio-carinata, supra medium leviter convexa, subtus valde convexa, glabra, haud ciliata, impresso-punctata, viridia, subnitida. *Pedunculus* 15–18 cm. longus,

medio bractearum pare instructus, glaber. *Bracteae* folia reducta simulantes, 1·5–1·8 cm. longae, suberectae, basi connatae. *Flores* sessiles, in capitula vel cymas capituliformes 1·2–1·5 cm. diametro dense conferti; capitula inferiora pedunculata, superiora sessilia vel subsessilia. *Sepala* 2 mm. longa, oblonga, obtusa, dorso valde convexa, glabra, ciliata, atrovirentia. *Petala* conniventi-erecta, 3 mm. longa, 1·6–1·7 mm. lata, basi connata, obovata, obtusa, dorso pone apicem apiculo conico obtuso crasse-carnoso instructa, glabra, alba. *Stamina* inclusa, glabra; filamenta alba; antherae luteae. *Glandulae hypogynae* subquadrangulares, truncatae, aurantiacae. *Carpella* in stylum brevissimum attenuata; stigma magnum, viride.

South Africa. Collected during the Percy Sladen expedition to the Orange River in 1910 by *Prof. Pearson*, No. 5486.

Described from a living plant which flowered at Kew in March, 1912.

1375. **Cotyledon procurva**, *N. E. Brown* [Crassulaceae]; affinis *C. triflorae*, Haw., sed foliis longe cuneatis multo angustioribus et floribus procurvis facile distinguitnr.

Herba nana, succulenta, perennis, glabra. *Folia* alterna, laxa, adscendentia, 3–5 cm. longa, apice 1·5–2·2 cm. lata, 7–8 mm. crassa, anguste cuneata, apice subtruncata et deinde in petiolum teretem 5–15 mm. longum cuneato-attenuata, laevia, epunctata, olivaceo-viridia vel purpureo-tincta, glauca. *Pedunculus* terminalis, 2–3 cm. longus, 2 mm. crassus, simplex, inferne nudus, snperne laxe spicatus, sordide purpureus, glaucus. *Flores* alterni, solitarii vel bini vel terni, subsessiles, minutissime bracteati. *Calyx* 2·5 mm. longus, minute et acute 5-dentatus, viridis, glaucus. *Corolla* procurva, in gemma peracuta; tubus 1 cm. longus, cylindricus, sordide purpureus; lobi 4–4·5 mm, longi, patentes vel recurvi, lanceolati, acuti, pallide roseo-purpurei.

South Africa. Locality and collector unknown. Described from a living plant which flowered at Kew, August 30th, 1911.

1376. **Callitriche compressa**, *N. E. Brown* [Haloragaceae]; affinis *C. deflexae*, A. Br., sed caulibus ancipitibus et carinis fructus non productis differt.

Herba aquatica, submersa, glabra. *Caulis* valde compressus, anceps. *Folia* uniformia, 4–10 mm. longa, 1–2 mm. lata, obovato-spathulata, obtusa. *Fructus* minutus, 0·70–0·75 mm. longus et latus, subquadrato-orbicularis, angulis subacute carinatis, sulco dorsali acuto. *Stigmata* quam fructus duplo breviora, deflexa, persistentia.

South Africa. Natal; in a stagnant pool at Umbilo, *Miss Franks in Herb. Wood*, 11943.

1377. **Eugenia pusilla**, *N. E. Brown* [Myrtaceae-Myrteae]; affinis *E. albanensi*, Sond., ei habitu simillima, sed foliis anguste lineari-lanceolatis facile distinguitur.

Herba perennis, 10–15 cm. alta. *Caules* annui, fasciculati, erecti, graciles, 0·6–0·7 mm. crassi, glabri. *Folia* opposita vel alterna, suberecta vel leviter patula, brevissime petiolata, 2–3·5 cm. longa, 2–3 mm. lata, anguste lineari-lanceolata, acuta, basi attenuata, uninervia, pellucido-punctata, marginibus revolutis, glabra. *Flores* solitarii, ex axillis foliorum inferiorum enati, omnino glabri. *Pedicelli* 1–2 cm. longi, graciles, apice bibracteati. *Bracteae* 2 mm.

longae, lineares, recurvae. *Sepala* 4, 2 mm. longa, latissime ovata, acuta. *Petala* delapsa. *Stamina* 3·5 mm. longa, incurva. *Ovarium* breviter obconicum.

South Africa. Transvaal: near Amsterdam, in Ermelo District, *Forbes*.

This species, although closely allied to *E. albanensis*, Sond., is so different from a *Eugenia* in general appearance, that until the flowers were examined would scarcely be suspected of belonging to that genus. It is locally known as "*Lomo*," and is suspected of poisoning sheep in the Ermelo District.

1378. **Mesembryanthemum Pearsonii**, *N. E. Brown* [Ficoideae-Mesembryeae]; affinis *M. testiculari*, Ait., sed foliis multo majoribus, calyce supra folia exserto, floribus minoribus bicoloribus differt.

Herba succulenta, 4–5 cm. alta. *Folia* 2, basi connata, adscendenti-patula, 3·5–4 cm. longa, 4·5 cm. lata, 2·5 cm. crassa, supra subplana marginibus acutis, dorso convexa, subgibbosa, leviter carinata, apice leviter convexa, laevia, glabra, alba nec glauca. *Flores* solitarii, inter folia terminales. *Pedunculi* validi, compressi, exserti, 2·5 cm. longi, quadribracteati. *Bracteae* inferiores foliis arcte contiguae, 1·5 cm. longae, 8 mm. latae, 8 mm. crassae, superiores minores, subacute trigonae, obtusae, laeves, glabrae, albae. *Calyx* 1·3 cm. diametro, 6-lobus, glaber; lobi 3–4 mm. longi, 5 mm. lati, latissime ovati, obtusi. *Corolla* 3–3·2 cm. diametro; petala 3–4-seriata, exteriora 1·3 cm. longa, linearia, obtusa, purpurea, interiora gradatim breviora, sordide lutea, rubro-vittata. *Stamina* numerosissima, patula, in annulum dense conferta; filamenta albida; antherae pallide luteae. *Styli* nulli; stigma sessile, discoideum, 5 mm. diametro, subcrenatum vel obscure lobatum.

South Africa. Probably a native of Little Namaqualand, collected during the Percy Sladen Expedition to the Orange River in 1910 by *Prof. Pearson*, No. 5482.

Described from a living plant sent by Prof. Pearson to Kew, where it flowered in November 1911. This species resembles *M. testiculare*, Ait., on a large scale, and differs from all others of which I have examined flowers in having a large discoid sessile stigma. The flowers expand at night or early morning, and are closed or partly closed during the day, and in colour are somewhat peculiar, the outer series of petals being mauve-purple, whilst 2–3 of the inner series are of a somewhat dull yellow, more or less streaked with purple.

1379. **Sphenoclea Dalzielii**, *N. E. Brown* [Campanulaceae]; species a *S. zeylanica*, Gaertn., spicis minoribus subglobosis vel breviter oblongis nec conicis et corolla quam lobis calycis duplo longiore differt.

Herba 0·3 m. alta, glabra, caule debili curvato vel flexuoso pauce ramoso. *Folia* alterna, patentia, subsessilia, 2–2·6 cm. longa, 6–11 mm. lata, oblonga vel obovato-oblonga, apice rotundata, basi cuneata. *Spicae* saepe foliis oppositae, 5–15 mm. longae, 5–7 mm. crassae, subglobosae vel oblongae, obtusae, nec conicae, pedunculatae, 10–25-florae. *Pedunculi* 0·4–1·1 cm. longi. *Sepala* 1·5 mm. longa et lata, suborbiculata, integra. *Corolla* sepalis duplo longior, campanulata, 5-loba; tubus 1·75–2 mm. longus; lobi 1 mm. longi,

oblongo-ovati, obtusissimi. *Stamina* inclusa; filamenta 0·4 mm. longa; antherae 0·4 mm. longae, 0·5 mm. latae. *Ovarium* apice depressum; stylus brevissimus; stigma simplex.

Northern Nigeria. Katagum district, *Dalziel*, 201.

During the 120 years that have elapsed since Gaertner established this remarkable genus, which more resembles a *Phytolacca* than one of the *Campanulaceae*, no second species has hitherto been added to it. The discovery of *S. Dalzielii* is therefore of more than ordinary interest. It differs from *S. zeylanica*, Gaertn., by its more flaccid stem, which seems to be of quite a different texture, much smaller and not conically pointed flower-spikes, a corolla twice as long as the calyx-lobes, stamens with filaments as long as (not shorter than) the anthers, and the latter broader than long, and much smaller than those of *S. zeylanica*.

1380. **Baissea breviloba**, *Stapf* [Apocynaceae-Echitideae]; affinis *B. subsessili*, Stapf (*Oncinoti subsessili*, K. Schum.), sed indumento tenuiore, foliis praeter nervorum axillas et costas glabris, inflorescentiis tenuioribus minute bracteatis, floribus 4 mm. haud excedentibus brevius lobatis distincta.

Frutex scandens, ramis gracilibus rufo-pubescentibus vel villosulis *Folia* oblonga, breviter acuminata, acumine apiculato, basi subtruncato-rotundata, circiter 5 mm. longa, 1·5–2 cm. lata, subcoriacea, in costa et in nervorum axillis pilosa, caeterum glabra, nervis secundariis utrinque 4–5 infra prominentibus tenuibus, venis transversis inconspicuis; petioli vix 2 mm. longi, pubescentes. *Cymae* in paniculas laxas subdivaricatas terminales et axillares foliis breviores dispositae, minute rufo-pubescentes; bracteae lanceolatae, acutae, infimae 2 mm., caeterae 1 mm. longae; pedicelli ad 3 mm. longi. *Calyx* minute pubescens, 1·5 mm. longus; sepala late ovata, subacuta. *Corolla* late campanulata, 4 mm. longa, extra minute rufo-tomentella; tubus intus supra staminum insertionem callis obtusis in annulum transversum confluentibus instructus, supra eam glaber, infra fasciculis pilorum argenteis ornatus; lobi e basi ovata lanceolati, acuti, tubo aequilongi vel eo paululo breviores. *Antherae* 2 mm. longae. *Ovarium* in vertice rufo-pubescens; stylus clavatus; stigma apice bifidum.

Tropical Africa. Southern Nigeria. Ikpe, *Farquhar*, 1.

In Thiselton-Dyer's Flora of Tropical Africa, vol. vi. p. 613, I stated that K. Schumann's *Oncinotis subsessilis*, which at the time was not represented at Kew, would probably have to be referred to *Baissea*. Specimens received since have confirmed that view, and they suggest its insertion and that of the present species after *B. angolensis* in the arrangement adopted in the Flora of Tropical Africa.

1381. **Farquharia**, *Stapf* [Apocynaceae-Echitideae]; genus novum habitu *Isonemati*, R. Br., simile, sed ob corollae lobos symmetricos et stamina ad tubum medium inserta et in eo tota inclusa plane distinctum, fructu seminibusque adhuc ignotis in tribu difficile disponendum.

Calyx parvus; sepala 5, subaequalia, imbricata, obtusa; glandulae intracalyculares 1–2, minutae. *Corolla* hypocraterimorpha; tubus cylindricus, supra medium paulo ampliatus, ore vix constrictus, nudus; lobi oblongi, obtusi, in alabastro dextrorsum obtegentes et leviter torti. *Stamina* sub medio tubo inserta, inclusa; antherae in

conum conniventes, lineares, breviter acuminatae, acutae, ob appendices loculis aequilongos inferne liberos sagittatae, inter crura antice pulvino albo-pilosulo instructae ; filamenta brevissima, in tubo breviter decurrentia, parte decurrente intus valde prominente. *Discus* 0. *Carpella* libera, densissime ferrugineo-tomentosa et pilis intricatis cohaerentia ; stylus filiformis ; stigma infra apiculum minutum incrassatum, 5-sulcatum, viscosum, antherarum basibus agglutinatum ; ovula numerosa, in placenta intus prominente pluriseriata. *Fructus* et semina ignota.—*Frutex* scandens (?). *Folia* opposita, subcoriacea, tenuiter nervosa ; glandulae axillares parvae, *Flores* in paniculam brevem corymbiformem dispositi.

F. elliptica, *Stapf* ; species unica.

Tota praeter inflorescentiam et novellas tenuissime ferrugineo-furfuraceo-pubescentes glaberrima. *Rami* teretes, juniores crassiusculi medulla ampla. *Folia* paribus 3–4·5 cm. distantibus, elliptica vel rarius oblongo-elliptica, abrupte breviter obtusiuscule acuminata, basi rotundata vel brevissime attenuata, 7–10 cm. longa, 4–6 cm. lata, chartacea vel subcoricea, nervis lateralibus utrinque circiter 4 patulis tenuissimis infra marginem arcuatim connexis saepe inconspicuis ; petiolus 3–5 mm. longus, supra profunde canaliculatus. *Inflorescentiae* rami primarii 2·5 cm., secundarii 0·5–1 cm., tertiarii circiter 2 mm. longi, cymas 3–1-floras gerentes ; pedicelli 3 mm. longi ; bracteae perlate ovatae, vix 1 mm. longae. *Calyx* vix 2 mm. longus, densissime tenuissime ferrugineo-puberulus ; sepala ovata. *Corolla* in alabastro maturo 2·5 cm. longa, extra praeter basin glabram tenuiter papillosa, intra in limbo papillosa, caeterum glabra ; tubus 16–17 mm. longus, supra medium 4–5 mm. latus ; lobi 9–10 mm. longi, 4–5 mm. lati. *Antherae* cum appendicibus 5 mm. longae. Stylus circiter 9 mm. longus, minute verruculosus.

Tropical Africa. Southern Nigeria : Benin District ; Mogumu, *J. H. J. Farquhar*, 8.

1382. **Omphalogonus nigritanus**, *N. E. Brown* [Asclepiadaceae-Periploceae] ; affinis *O. calophyllo*, Baill., sed foliis brevioribus apice obtusioribus vel subtruncate rotundatis, cymis minoribus et lobis exterioribus coronae obtusissime gibbosis differt.

Caulis volubilis, glaber. *Folia* opposita, petiolata, glabra ; petioli 2–3 cm. longi ; laminae 6–10 cm. longae, 5–8 cm. latae, elliptico-ovatae vel elliptico-oblongae, apice obtusissimae vul subtruncato-rotundatae, breviter cuspidatae, basi cordatae vel subcordatae, siccatae subtus glaucae, venis nigris percursae. *Cymae* axillares, pedunculatae, 4–6 cm. diametro, glabrae. *Pedunculi* 1·5–1·7 cm. longi. *Bracteae* parvae, squamiformes. *Pedicelli* 3–5 mm. longi. *Sepala* 3 mm. longa, subrotunda, obtusissima. *Corolla* 2·5 cm. diametro, rotata, ad medium 5-loba, extra glabra, intra papillato-puberula, atro-purpurea ? ; discus patelliformis ; lobi 9 mm. longi, 8 mm. lati, elliptico-oblongi, apice rotundati. *Coronae lobi* 5, antheris oppositi, bilobulati, lobulis antepositis ; lobulus interior erectus, 1·5 mm. longus, subcuneato-oblongus, apice emarginatus, antice canaliculatus ; lobulus posticus radiatus, corollae adnatus, valde compressus, apice in gibbum obtuse rotundatum 0·5 mm. longum elevatus. *Antherae* pilis longis hirsutae.

Tropical Africa. Southern Nigeria: without locality, *N. W. Thomas*, 1011.

When working out the Asclepiads for the Flora of Tropical Africa I had not seen a specimen of this genus, but afterwards specimens of *O. calophyllus*, Baill. were received at Kew, when I found that Baillon's description of the corona is erroneous, as this genus has not a double corona. The corona consists of 5 lobes opposite the anthers, but each lobe has a basal much compressed process radiating from it and adnate to the corolla-tube or disk and forming 5 partitions, which divide the tube into 5 pocket-like cavities. In *O. calophyllus* the apex of these partitions rises into an acute subulate point; in *O. nigritanus* it forms a rounded compressed hump. The inner part of the coronal-lobe is erect, cuneate-oblong, notched at the apex and channelled down the face in both species. The flowers of both dry black.

1383. **Caralluma corrugata**, *N. E. Brown* [Asclepiadaceae-Stapelieae]; species floribus solitariis concentrice corrugatis ab omnibus distinctissima.

Caules vel rami primarii superne multiramosi, glabri; ramuli siccati 2·5–8 cm. longi, 3–6 mm. crassi, conferti, 3–4-angulati; anguli dentibus parvis late deltoideis apice minutissime tomentellis instructi. *Flores* solitarii, terminales et infra apicem ramorum dispositi. *Pedicelli* 1–2 (fructu 4–8) mm. longi, glabri. *Sepala* 1·3–2 mm. longa, ovato-lanceolata, acuta vel acuminata, glabra. *Corolla* 1·9–2·1 cm. diametro, extra laevis, intra in tubo et disco concentrice corrugata et in lobis tuberculata, glabra, brunneo-purpurea (?); tubus campanulatus, 4 mm. longus; lobi patentissimi, 6–7 mm. longi, 7 mm. lati, deltoideo-ovati, acuti, marginibus recurvis. *Corona exterior* 10-dentata; dentes per paria antheris oppositi, erecti, 0·5 mm. longi, subulati, pilis paucis instructi. *Coronae interioris* lobi 0·75 mm. longi, subulato-lineares, obtusi, antheras aequantes et iis arcte incumbentes.

Tropical Africa. British Somaliland: without precise locality, *Drake Brockman*, 477, 478.

1384. **Caralluma Dalzielii**, *N. E. Brown* [Asclepiadaceae-Stapelieae]; affinis *C. adscendenti*, R. Br., sed duplo minor et corollae lobis longe ciliatis differt.

Herba succulenta, 15–28 cm. alta, e basi ramosa; rami erecti, tetragoni, basi 8 mm. crassi, deinde usque ad apicem gradatim attenuati, glabri, angulis dentatis; dentes in folia rudimentaria subulata 3–4 mm. longa transeuntes. *Flores* fasciculati, penduli; fasciculi axillares, 2–3-flori, secus partem superiorem ramorum laxe dispositi. *Pedicelli* 2–3 mm. longi, recurvi, glabri. *Sepala* 2 mm. longa, subulata, acuta, glabra. *Corolla* 1 cm. diametro, 5 loba; tubus 1·5 mm. longus, cupularis, glaber; lobi patuli, 4·5–5 mm. longi, 1·5 mm. lati, lanceolati, subulato-acuminati, replicati, extra glabri, intra pilis tenuissimis sparse pubescentes et pilis longis fusiformibus atropurpureis supra medium dense ciliati, basi albidi (vel lutescentes ?) purpureo-maculati, superne atropurpurei. *Coronae* lobi exteriores 1–1·3 mm. longi, erecti, profunde bipartiti, segmentis subparallelis subulatis, fusco-purpurei, glabri; lobi interiores 0·6 mm. longi, antheris incumbentes, deltoideo-oblongi, obtusi, glabri, fusco-purpurei.

Tropical Africa. Northern Nigeria: Katagum District, *Dalziel*, 317; on rocky hills at Sokoto, sometimes planted near houses, native name "Karan Masallachi," *Dalziel*, 367.

Described from dried specimens and fresh material preserved in formalin. The fine and scanty pubescence on the inner face of the corolla-lobes is quite invisible on dried flowers that have been boiled for dissection, until all moisture has evaporated from the surface. The long hairs fringing the lobes are also very easily detached, and in the specimens examined were mostly only to be found in unopened buds.

1385. **Thorncroftia**, *N. E. Brown* [Labiatae-Ocimoideae]; genus novum affinis *Orthosiphoni*, Benth., sed corollae labio inferiore a basi tripartito et stigmate profunde bifido differt.

Calyx campanulatus, bilabiatus, fructifer horizontalis; labium superius ovatum, acutum, in tubum decurrens; labium inferius subaequaliter 4-dentatum, dentibus anguste deltoideis acutis. *Corolla* bilabiata; tubus longe exsertus, rectus, cylindricus; labium superius cuneato-oblongum, apice emarginatum; labium inferius a basi tripartitum, segmentis lateralibus lineari-lanceolatis subacutis, segmento medio concavo obtuso. *Stamina* 4, didynamia, declinata, ad os tubi corollae inserta, libera, exserta; antherae confluentes uniloculares. *Discus* parvus, antice in glandulam tumens. *Stylus* apice aequaliter bifidus. *Nuculae* subellipsoideae, apice leviter corrugatae.—*Herba* bipedalis. *Folia* opposita, parvula, petiolata. *Flores* oppositi, pedicellati, in racemos paniculatim dispositi.

T. longiflora, *N. E. Brown*; species unica.

Herba perennis, bipedalis, ramosa, ubique puberula. *Folia* breviter petiolata, subcrassa, 0·5–2·5 cm. longa, 1·5–10 mm. lata, elliptico-lanceolata, obtusa, basi cuneata, integra vel paucidentata. *Racemi* 3–6 cm. longi, in paniculam terminalem 12–15 cm. longam dispositi. *Pedicelli* 3–4 mm. longi. *Calyx* 4 mm., demum 6 mm. longus. *Corolla* carnea; tubus 3·5–3·8 cm. longus, rectus, anguste cylindricus, fauce haud ampliata; labium superius 1 cm. longum, 7 mm. latum, cuneato-oblongum, apice emarginatum; labium inferius a basi tripartitum, segmentis lateralibus 6 mm. longis 1·5 mm. latis lineari-lanceolatis subobtusis, segmento medio 6–7 mm. longo explanato 3·5–4 mm. lato elliptico-oblongo obtuso. *Stamina* 7–9 mm. longa. *Stylus* aequaliter bifidus, lobis linearibus subobtusis. *Nucleae* subellipsoideae, apice leviter impresso-rugulosae.

South Africa. Transvaal: among rocks near Barberton, 1220 m., *Thorncroft*, 795.

In general appearance this plant much resembles *Syncolostemon densiflorus*, Benth., and when out of flower might possibly be mistaken for it, but the corolla, instead of having only 2 entire or slightly lobed lips, is distinctly 4-lobed, one lobe forming the upper lip and three lobes forming the lower lip, so that it cannot be generically associated with either *Syncolostemon* or *Orthosiphon*. The tube of the corolla is unusually long.

1386. **Leucadendron pseudospathulatum**, *Phillips et Hutchinson* in Dyer Fl. Cap. vol. v., sect. 1, p. 543, anglice [Proteaceae-Proteeae]; affinis *L. spathulato*, R. Br., foliis rectis obovato-oblanceolatis basi breviter angustatis trinerviis differt.

Ramuli leviter sulcati, glabri. *Folia* obovata vel oblanceolata, apice subacuta, basi angustata et trinervia, 2·5–4 cm. longa, 1–1·5 cm. lata, rigide coriacea, utrinque glabra, margine anguste cartilaginea. *Inflorescentia* ♂ depresso-globosa, circiter 2·5 cm. diametro, bracteis 2-seriatis involucrata; involucri bracteae coloratae, ovatae, subacuminatae, ad 1 cm. longae et 6 mm. latae, coriaceae, glabrae, margine ciliatae; bracteae floriferae oblongo-lanceolatae vel lineari-lanceolatae, subacutae, 1 cm. longae, ciliatae. *Perianthii* tubus 8 mm. longus, superne villosus; segmenta 6 mm. longa, glabra; limbus lineari-oblongus, 4 mm. longus, glaber. *Antherae* lineares, 3 mm. longae. *Stylus* 1·1 cm. longus; stigma 2 mm. longum. *Infructescentia* subglobosa, vix 2·5 cm. diametro; bracteae 5-seriatae, inferne fulvo-villosae, superne glabrae. *Fructus* transverse ellipsoidei, 4 mm. longi, 1 cm. lati, glabri.

South Africa. Cape Colony: Clanwilliam Div.; near Honig Valley and on Koude Berg, *Drège*, aa. Worcester Div.; Hex River Valley, *Wolley-Dod*, 4042.

1387. **Mimetes integra**, *Hutchinson* in Dyer Fl. Cap. vol. v. sect. i, p. 647, anglice [Proteaceae-Proteeae]; affinis *M. argenteae*, Knight, sed foliis argenteo-tomentosis, involucri bracteis exterioribus tenuiter pubescentibus, floribus pro rata minus exsertis.

Rami dense villosi. *Folia* lanceolata vel elliptico-lanceolata, apice integra, subacute callosa, basi leviter angustata, 5–5·5 cm. longa, circiter 2 cm. lata, dense adpresse argenteo-tomentosa; nervis lateralibus ascendentibus distinctis. *Inflorescentia* quam folia multo breviora, 4–4·5 cm. longa. *Capitula* versus apices ramulorum aggregata, 7–8-flora; involucri bracteae exteriores ovatae, obtusae, 6–8 mm. longae, 5 mm. latae, intermediae oblongae, apice rotundatae, circiter 1·2 cm. longae et 6 mm. latae, extra tenuiter adpresse pubescentes, intus glabrae, striatae, interiores (circiter 8) 1·2–1·4 cm. longae, lineares, extus dense villosae, intus glabrae. *Receptaculum* tenuiter setosum. *Perianthii* tubus brevissimus; segmenta 2·5 cm. longa, filiformia, tenuiter subadpresse pubescentia; limbus 7–8 mm. longus, linearis, acutus, extus breviter pubescens et tenuiter longe pilosus. *Antherae* 2·5 mm. longae. *Squamae* hypogynae subulato-filiformes, 2 mm. longae. *Ovarium* anguste ovoideum, 1 mm. longum, breviter pubescens; stylus 2·5 mm. longus, filiformis, glaber; stigma lineare, obtusum, 6 mm. longum. *M. Massoni*, Meisn. in DC. Prodr. vol. xiv. p. 264, partim, non R. Br.

South Africa. Caledon Div.; banks of the Zondereinde River, near Appels Kraal or neighbouring mountains, *Zeyher*, 3688.

1388. **Micrococca lancifolia**, *Prain* [Euphorbiaceae-Crotoneae]; species *M. capensi*, Prain, quam maxime affinis, differt foliis angustioribus secus nervos utrinque pubescentibus, ramulis crassioribus rhachibus petiolisque pubescentibus bracteisque majoribus.

Frutex dioicus erectus, ramulis crassiusculis dense pubescentibus. *Folia* petiolata, membranacea, lanceolata, acute acuminata, basi cuneata, margine crebre minute serrata, 10–12 cm. longa, 1·5–2·5 cm. lata, nervis utrinsecus 5–6 ascendentibus intra marginem anastomosantibus, subtus parum nervo mediano elevatis, juniora purpurascentia, utrinque secus nervos dense pubescentia ceterum glabra.

Racemi axillares ; masculi ignoti ; feminei 8–10 cm. longi, rhachis parce pubescens triente imo nudo excepto dissite florifera ; bracteae ovato-lanceolatae, bracteolaeque lanceolatae pubescentes ; pedicelli dense pubescentes, 4 mm. longi, bracteis duplo longiores. *Calyx* feminei 3-partitus ; lobi ovati, acuti, 3 mm. longi. *Squamae hypogynae* petaloideae, lanceolatae, 2 mm. longae. *Ovarium* 3-loculare, dense adpresse hirsutum ; styli 3, 2 mm. longi, basi connatae, fimbriato-laciniatae, reflexae. *Capsula* 3-cocca, 1 cm. lata ; cocci 2-valves, purpurascentes, parce hirsuti, crustacei, simul loculicide septicideque dehiscentes. *Semina* globosa, vix matura.

MADAGASCAR. North Madagascar, *Baron*, 6310.

1389. **Asparagus zuluensis**, *N. E. Brown* [Liliaceae-Asparageae] ; affinis *A. retrofracto*, Linn., sed ramis rectioribus, foliis squamiformibus brunneis (nec albis), cladodiis brevioribus et antheris plus quam duplo brevioribus differt.

Suffrutex scandens, glaber. *Caules* vetustiores brunneo-cinerei ; rami et ramuli solitarii vel 2–8 verticillati, horizontaliter patuli, recti, graciles, ramis 8–16 cm. longis, ramulis 1·5–5 cm. longis. *Folia* squamiformia 3–4 mm. longa, ovata, acutissima, profunde concava, fusco-brunnea. *Cladodia* numerossissima, tenuissima, verticillata, incurvata, 1·2–1·4 cm. longa, 0·3 mm. crassa, filiformia, acuta. *Flores* in axillis cladodiorum solitarii. *Pedicelli* 6–7 mm. longi, infra medium articulati, parte persistente 2 mm. longa. *Perianthium* 2·5–3 mm. longum ; segmenta oblonga, obtusa. *Stamina* inclusa ; filamenta anguste linearia ; antherae perparvae, vix 0·5 mm. longae et latae, suborbiculares. *Ovarium* breviter stipitatum, trigono-globoso-obovatum, subgranulato-rugosum ; stylus 0·75 mm. longus, apice trifidus, inferne leviter incrassatus.

SOUTH AFRICA. Zululand, from a plant collected by Mr. J. Wylie and cultivated in Durban Botanic Garden, Natal, *Wood*, 11969.

1390. **Stylochiton Rogersii**, *N. E. Brown* [Aroideae-Stylochitoneae] ; affinis *S. lobato*, N. E. Brown, sed foliis angustioribus, spathae tubo multo longiore et spadice incluso differt.

Herba perennis, tuberosa. *Folia* 4–5, radicalia, glabra ; petioli 7–10 cm. longi, ad medium vaginati, variegati ; laminae anguste sagittato-hastatae ; lobum anticum 10–15 cm. longum, 1·1–1·8 cm. latum, lineare, acutum ; lobi postici 2·5–4·5 cm. longi, 4–8 mm. lati, lineares, obtusi. *Spathae* 1–2, axillares, petiolos subaequantes, pedunculatae; tubus 5·5 cm. longus, 1·3 cm. latus ; limbus obliquus, acutus, 2·5 cm. longus, extra viridis, intra albidus ? *Spadix* inclusus, 5·3 cm. longus. *Flores feminei* 7, monocyclicae, liberae ; perianthium totum adnatum, obliquum. *Flores masculi* dense conferti ; perianthium compressum, 4-dentatum ; stamina libera ; filamenta brevissime clavata, crassa.

PORTUGUESE EAST AFRICA. Near Villa Machado, *Rogers*, 4500.

XXXIII.—SOME GARDENS AND PARKS IN S. EUROPE.

W. J. Bean.

Four years ago at the desire of the Director I visited a number of gardens and parks in Central Europe, and some notes on that journey appeared in the *Kew Bulletin* for 1908, p. 387. During April of the present year I was directed to make a journey with similar objects in Italy and Dalmatia. On this the following notes are based :—

La Mortola.

As an only slightly lengthened journey was involved it appeared desirable to reach Italy by way of the French Riviera, and thus I was enabled to devote four days to visiting the famous gardens at Hyères, Villa Thuret and Eilen Roc (at Antibes), Monte Carlo and La Mortola. A fortnight or three weeks might very profitably be spent on the seaboard between Marseilles and Genoa, but if there were only time to visit a single garden that garden should be La Mortola. There are of course finer individual specimens of certain plants to be found in other gardens, but nowhere is there such wealth and variety and such general excellence as at La Mortola. Founded by the late Sir Thomas Hanbury, and still maintained in all its efficiency by Lady and Mr. Cecil Hanbury, it is to all intents and purposes a first-rate botanic garden, combining with its scientific value admirable object lessons in cultivation and landscape art.

La Mortola has so frequently been described in the public press that it is unnecessary to attempt the task again. Notes in connection with it have appeared in previous numbers of the *Bulletin* (*see* 1889, p. 287 ; and 1892, p. 1). The gardens stand picturesquely on a steep slope washed at its base by the Mediterranean. Many years of assiduous collecting, combined with excellent cultivation, have established on this spot a rich collection of plants from sub-tropical and warm temperate regions. Probably no open air collection on the continent surpasses this in number of species, certainly nowhere else are these plants to be seen in more characteristic form and beauty. It would be too long a task to do more than speak in general terms of the collection. To one whose experience has been confined to northern gardens almost every step at La Mortola reveals some striking or unfamiliar plant, perhaps one he has hitherto only known as a weakling in a pot growing in all its natural luxuriance, many altogether new and unfamiliar to him.

Mention of a few of the plants in flower on April 4th will give some idea of the diversity of the collection here : *Aloe Hanburyana* with crowds of brilliant red spikes, *A. plicatilis*, coral red, *A. Marlothii*, rich crimson and orange, *A. rubro-violacea* ; *Dimorphotheca aurantiaca*, *Echium fastuosum*, *Gnidia carinata* (yellow), *Grevillea vestita* (white), *G. Thelemanniana* (scarlet) ; *Mesembryanthemum edule*, *M. atroviolaceum* (with lustrous purplish-violet flowers), *Sutherlandia frutescens*, *Calodendron capense*, *Fuchsia arborescens*, *Leptosyne gigantea* (yellow, and very showy on walls), *Berckheya grandiflora* (a shrubby composite, with bright yellow heads 3 to 4 inches across), *Wigandia caracasana* (known in England as a plant for sub-tropical bedding, here a small tree carrying noble panicles of purple

flowers), *Tecoma australis* (pale yellow), *Jasminum primulinum*, *Pilocarpus pennatifolius* (with slender racemes of lurid purple flowers, *see* Bot. Mag. t. 7235), *Odontospermum sericeum* (yellow flowers and silky grey foliage), *Iochroma lanceolata*, *Pittosporum phillyraeoides* (with elegant pendulous branchlets clothed with blossom); *Sophora secundiflora* (a bushy evergreen 10 ft. high with Wistaria-like thyrses of dark blue and white flowers, strikingly handsome), *Eucalyptus crebra* (with rugged cork-like bark), *Leptospermum laevigatum*; *Cytisus filipes* 10 ft. high, a cascade of milk-white flowers.

Succulent plants thrive remarkably well and there is a very extensive collection of them. Among Agaves, the vividly glaucous *A. Franzosini* is perhaps most conspicuous, and among Opuntias none so pleasing as *O. tunicata*, very abundant here on walls and other places and always conspicuous in the slender spines 2 inches long covered with a white membranous sheath. Of ordinary flowering things like roses it is not necessary to write, but they made a beautiful display, and here I first saw the glorious masses of the various Banksian roses in bloom which give to Italian gardens at this season their greatest charm.

Hyères.

The Acclimatisation Garden at Hyères is a branch of the establishment at Paris. The most imposing trees in the garden are *Eucalyptus globulus* which, both here and at Villa Thuret, overshadow all native trees. It was here I first saw in quantity *Pittosporum Tobira*, a Japanese species. It is the most conspicuous evergreen in this garden and bore large crops of deliciously scented flowers, open and in bud. In the gardens of Italy and even Dalmatia this Pittosporum is planted in great numbers, being only less abundant than *Euonymus japonicus* and much more pleasing. It is always effective either as a picturesque isolated bush (I saw them 25 ft. high on the Isle of Lacroma), in masses, or as a hedge. It promises to fill the same place in these countries as *Rhododendron ponticum* or Cherry laurel does at home, and is perhaps in danger of being equally overplanted. At Hyères, *Melaleuca thymifolia* is 25 ft. high, its slender pendulous branches extremely elegant, *Cereus monstrosa* is 10 ft. high, and deserving of mention are two fine pyramidal examples of *Juniperus drupacea* (male and female), and a group of five magnificent *Washingtonia robusta*, perhaps 50 ft. high.

Hyères is noted for the abundance of palms, mostly *Phoenix canariensis*, in its streets. They meet the eye at every turn and many of them are now of great size, with rugged picturesque trunks. I believe the town is proud of them. A rainy morning, such as the one when I was there, is certainly not the best time to appreciate avenues of *Phoenix*, but it appeared to me that the sullen grey tints of these innumerable palms give a sombre, almost funereal, aspect to the town.

Villa Thuret, Cap d'Antibes.

On a hill outside the little town of Antibes is the famous garden of Villa Thuret, containing an extensive collection of exotic trees and shrubs founded chiefly by the late Charles Naudin. It is a

picturesque garden of quite informal design richly stocked (too richly, indeed, to secure the best landscape effects) with plants from Australia, New Zealand, Chile, Japan and S. Europe. The conifers are very good, and it was interesting to see well-grown trees of such species as *Tetraclinis articulata* (40 ft.), *Podocarpus macrophyllus*, an elegant slender tree 45 ft. high, *Cupressus lusitanica* (perhaps 80 ft.) and *Taxodium distichum* with pendulous branchlets. *Araucaria excelsa* grows to a good size on this coast but seems to be thinly furnished and damaged by wind. I saw no tree anything like so well furnished and graceful as the one in the Temperate House at Kew. *A. Bidwillii*, on the other hand, 40 ft. high, is in perfect condition. *Cycas revoluta* is common in the open air in S. France and Italy, but other cycads are rarely seen. Here at Villa Thuret were *Encephalartos Lehmannii* and *E. longifolius*. Among palms other than common *Phoenix*, *Trachycarpus*, etc., the most striking are fine examples of *Erythraea armata* (or *Brahea Roezlii* as it is usually named here), its curving fronds being of an intense glaucous hue. Eucalypti of various sorts thrive exceedingly, some with trunks perfectly smooth others with the bark hanging loose in large strips or flakes. Here, as at Hyères, it is the Eucalypti that stand up above all other trees and first catch the eye as one approaches the garden.

In flower I noticed *Pittosporum undulatum* (25 ft. high), *Polygala myrtifolia*, *Catha edulis*, the curious "Arabian tea," which flowers only on shoots with opposite leaves, the barren shoots having alternate ones; *Guichenotia ledifolia*, *Leptospermum laevigatum*, 25 ft. high, with shredding bark, *Westringia rosmarinifolia*, *Wiganidia caracasana*. Here I first met with *Spiraea cantoniensis* in flower, both single and double—a Chinese shrub that has spread all through Italy and Dalmatia both in public and private gardens, its long arching sprays of pure white flowers making it there the most graceful and beautiful of all deciduous shrubs in flower in April. It is scarcely hardy at Kew.

There is much of interest horticulturally on the Cap d'Antibes; a great trade is done in early roses for cut flower, and one grower makes a speciality of Gerberas, his stock, I believe, having originated from the varieties raised by Mr Irwin Lynch at the Cambridge Botanic Garden. No one should miss the wonderful gardens of Eilen Roc which are open on Tuesdays on payment of one franc. They stand upon, and partially cover, rocky cliffs washed at the base by the Mediterranean, and through and about them walks lead one to most enchanting views of coast, mountain and sea. The gardens themselves, owned by Mr. Wylie, are perfectly kept and well stocked with choice plants. The entrance fees, now amounting to several hundreds of pounds per annum, are devoted to charitable purposes. A similar arrangement obtains at La Mortola.

Milan.

Visitors to Milan who are interested in park planting should pay a visit to the Giardino Pubblici. It is not often one sees a public park so admirably planted. The ground is undulating but not hilly, and the well-planned walks lead the pedestrian to a succession of

beautiful vistas and tree groups. I do not know the date of the foundation of the park; many of the trees must be 100 or more years old, but may have existed on the site previously. The designer appreciated the higher landscape value in gardens of grouped trees and shrubs as compared with a mixture of individuals, and the provision of spacious lawns helps to the appreciation of their beauties. The Judas-tree was really splendid here. A group of about twenty *Taxodium distichum* approaching 100 ft. in height planted near the lake have developed conspicuous "knees." A group of magnificent fastigiate oaks made a bold and striking picture, and *Magnolia grandiflora* planted in a mass was 50 ft. high. A great hollow rectangle of horse chestnuts in flower made an effective display. Cedars and especially the deodar are exceptionally vigorous, but some other conifers like common spruce are poor and should be removed. *Aegle sepiaria* has occasionally been suggested as a hedge plant in England. There is one in this park about 100 yds. long, not so efficient a barrier as I should have imagined. Probably the persistent clipping prevents the full development of formidable spines, and its restriction to 3 or 4 ft. in height may curb its energies too much. A group of *Musa Basjoo* (or *japonica*) here, as in other places, looked very forlorn with stems bare or carrying but one or two battered leaves, leading one to wonder (as with some bamboos at home) whether their beauty at one part of the year sufficiently compensates for their depressing appearance during the remainder.

The people of Milan have reason to be proud of their park, but they ought to treat it with more respect. Restaurants and wine shops may perhaps be regarded as necessary evils, but some malodorous aviaries made of wire netting should be removed, and automatic weighing machines could be dispensed with. Nor should a public park be sprinkled over with effigies of departed worthies who, however eminent or patriotic, seem rarely to have been pre-possessing.

Between the Castello and the Arco della Pace is the extensive "Nuova Parco," planted with intelligence on the lines of the older gardens, but too new to be interesting and too much given up to motors and other wheeled traffic ever to possess the charm of the smaller and older garden—from which such traffic is excluded.

Pallanza.

There is much that is interesting to be seen by the lover of gardens and especially of trees and shrubs in and about Pallanza. There is the well-known nursery of the Brothers Rovelli and many well kept gardens belonging to private houses and hotels, and, within an hour's row on Lake Maggiore, are the famous gardens of Isola Bella and Isola Madre. The vegetation generally is luxuriant and presents rich and varied tints that give a pleasant change from the grey olive-clad country farther south.

Messrs. Rovelli's nursery occupies an elevated promontory jutting out into Lake Maggiore, charming views of which on both sides are obtained from the summit. On the other hand, to the view of travellers along the road which follows the margin of the lake, the nursery presents a remarkable variety and wealth of vegetation.

The grounds are of especial interest for the large specimens of trees they contain that are scarcely hardy in the British Isles or only in the south-west. Of Mexican pines, there are *Pinus pseudo-patula* with picturesquely rugged bark, *P. Wincesteriana* and *P. Russelliana* (forms of the very variable *P. Montezumae*), *P. Llaveana* and *P. patula* (the last 35 ft. high, a striking mass of drooping foliage of a pale glaucous hue) all trees of unusual size in Europe. *P. canariensis* is 35 ft. high but apparently suffers from cold. The most interesting conifer in the nursery is a superb example of *Keteleeria* (*Abies*) *Fortunei*, quite unrivalled in Europe. It is about 85 ft. high and its erect shapely trunk is about 2 ft. 9 in. in diameter, furnished to the base with branches. The ground about was strewn with old cones. Not far from it is a grand specimen of golden larch (*Pseudolarix Fortunei*) between 90 and 100 ft. high and 9 ft. in girth near the base. This tree is, of course, quite hardy in England; what makes the Pallanza tree so interesting besides its noble dimensions is its fertility. Mr. W. B. Hemsley, in writing of this species in the Botanical Magazine, t. 8176, observes that the only perfect seeds he had been able to find were some that Fortune collected 50 years before, now preserved in spirit at Kew. But beneath the branches of Messrs. Rovelli's tree are hundreds of young seedling trees that have sprouted from its fallen seeds. They vary from 1 to 6 years old and from a few inches to 2 or 3 ft. in height.

The New Zealand *Podocarpus Totara* is 30 ft. high; *P. chilina* 25 ft. A female *Araucaria brasiliensis* is 60 to 70 ft. high with a slender trunk 15 inches in diameter. There are also a good *Abies religiosa*, a Mexican fir only grown in a few places in the mildest parts of the British Isles, a splendid *A. bracteata*—so rarely seen in fine condition, and *Cunninghamia sinensis*, of which the same has to be said. *Pinus australis*, the true pitch pine, is 50 ft. high.

Other plants besides conifers that were noted are too numerous to mention, but a few deserve special notice:—*Aegle sepiaria* is 12 ft. high and as much through and bears fruit freely; its ally, the little *Citrus japonica*, was covered with its brightly coloured yellow fruits about the size of large marbles. *Eugenia apiculata* is 30 ft. high; *Illicium religiosum* prettily in flower; *Camellia Sasanqua alba* 18 ft. high and only a little less wide, a dense bush; the variety *rosea* nearly as large; *Olea fragrans* 25 ft. high and over 30 ft. through; and there are large bushes of the tea plant. *Rhododendron Sesterianum*, one of the hybrids between *R. ciliatum* and *R. Edgeworthii*, 6 ft. high and laden with blossom, made an exquisite picture.

Isola Bella and Isola Madre.

In order to visit these two islands conveniently it is best to take a rowing boat from Pallanza or Baveno; the regular steamers that ply on Lake Maggiore call at Isola Bella but not at Isola Madre, which for its vegetation is decidedly the more interesting.

Isola Bella is the most noted of the group of Borromean Islands and is one of the beauty spots of N. Italy. Originally a rocky islet, it was converted into its present fertile state about 1671 by

the then chief of the ancient and famous family of Borromeo, who had soil conveyed to the island and the foundation of the present gardens laid. On the west side they occupy ten terraces rising one above the other. The trees and shrubs of Isola Bella exhibit a remarkable luxuriance of growth. There is a common camphor tree, for instance, with a bole over 3 ft. in diameter; *Quillaja saponaria* is 43 ft. high; *Pieris nitida* 20 ft. high; bushes of *Azalea indica* 20 ft. through, both purple and white varieties. Among more uncommon things, *Rosa Watsoni*, a species with thin narrow leaflets and rarely seen in good condition with us, is 6 ft. high; the noble round-leaved *Dombeya* (*Astrapaea*) *Wallichii* 9 ft. high; *Cryptocarya Peumus* 25 ft.; *Magnolia fuscata* 15 ft. high; *Eucalyptus amygdalina* with a trunk 2 ft. 3 in. in diameter, smooth and grey. The growth of bamboos here equals that of the French and Italian Riviera; *Phyllostachys mitis* is over 30 ft. high, and the not frequently seen *Bambusa quadrangularis* 12 ft.

A few minutes' rowing brings one to the rocky Isola Madre. Here is an extensive collection of trees and shrubs growing in the open air, especially of Australian and Chilean ones. Among the first things that strike one in ascending from the little landing place is a *Jubaea spectabilis* with a trunk as thick as the one in the Temperate House at Kew and clear of leaves for 25 ft. up. After having traversed the Riviera, *Magnolia grandiflora* has become so familiar that one almost ceases to remark it, but here at Isola Madre it is so fine that one's admiration is perforce renewed. A mass of *Beschorneria yuccoides* with its tall arching panicles of scarlet flowers gave a charming combination of grace and bright colour. An *Elaeagnus*—always called *E. reflexus* in the S. of Europe—which from the shining brown undersurface of the leaves must be a form of *E. glabra* or perhaps a hybrid between it and *E. pungens*, is occasionally seen in English gardens as a low spreading evergreen shrub. In S. France and Italy it becomes a climber; at La Mortola it had reached the top of a pine 40 ft. high; in some places it is used as a thick, clipped hedge trained on iron fencing. Here at Isola Madre it serves admirably for forming arbors. It appears to have some value as a sea-side plant. At the Chateau of Miramar near Trieste I saw masses of it luxuriating on cliffs within a few yards of the Adriatic.

Cupressus cashmeriana.—The most interesting and remarkable tree on Isola Madre is the Cashmere cypress. The history of this species is somewhat obscure and its native country—most probably N.W. India—is not certainly known. It may even be a form of *C. torulosa*. It has a scattered distribution as a cultivated tree in N. India and few plants of it exist in Europe; the best in the United Kingdom is in the Himalayan House at Kew. By far the finest tree in Europe is this one on Isola Madre, now about 65 ft. high and over 6 feet in girth of trunk. Its foliage is of a vivid silvery grey and its branchlets, being long and slender, hang gracefully all round the tree. The only other tree of any size that I saw was a smaller one in the garden of the Casa Mestorff on the shores of Lake Maggiore at Pallanza.

Banksian Roses.—The most fascinating of all plants in this part of the world in April and May is the Banksian rose. Altogether

there seem to be five forms of it: single white (in two forms, large and small), single yellow, double white and double yellow. Of these the double yellow would appear to be the most popular. One sees it grown in various ways, such as on and over walls, on arches, on pergolas, and on trees, but its beauty never palls, for associated with the colour beauty of its blossoms are the rich verdancy of its leaves and the unsurpassed grace of its long slender branches. At Isola Madre it has reached the top of a common bay tree and now drapes it almost to the base, at the time I saw it a slender pyramid of glorious yellow 40 ft. high.

The Deodar succeeds admirably wherever I saw it in Italy, and at Isola Madre it was magnificent. Of other trees hardy in Britain I noted *Libocedrus decurrens* with a trunk over 3 ft. through and, as I noticed elsewhere, not columnar in shape as it usually is with us, but pyramidal and more spreading, *Taxodium distichum*, *Liquidambar styraciflua* 70 ft. high, *Aegle sepiaria* a tree 15 ft. high, *Abies Pinsapo* and Lawson cypress. On the other hand the difference between this and the average climate of Great Britain is shown by the existence of such plants luxuriating out-of-doors as the following: *Acacia dealbata A. Baileyana*, *A. melanoxylon*, *A. longifolia*, *A. pravissima*, *Hakea saligna* (in bloom), *Podocarpus Totara*, *Rhododendron arboreum* 30 ft. high with a trunk 18 inches in diameter, *Fatsia papyrifera*, *Casuarina equisitifolia*, Agaves, Dasylirions and Opuntias. *Erica arborea* here fully justifies its specific name.

Florence.

At Florence I had the good fortune to have the guidance of Professor Beccari, once Director of the Botanic Garden at Florence. At Kew Prof. Beccari is held in particular esteem as the donor of two of the most remarkable plants ever introduced to Europe, viz., *Amorphophallus Titanum*, which first flowered at Kew in 1889 (*see* Bot. Mag. tt. 7152–4–5), and *Bulbophyllum Beccari*, which flowered in the Orchid Houses at Kew in 1881 (*see* Bot. Mag. t. 6567). In his own garden in the suburbs of Florence Prof. Beccari cultivates an interesting selection of palms in the open air, two of which by his kindness we were enabled to illustrate. The more remarkable one, *Nannorhops Ritchieana*, Wendland,* a very rare palm from N.W. India, is the finest in Europe. It is 25 years old and forms a large cluster of leaves rising directly from the ground (having as yet no visible stem) and measures 10 ft. in height, 15 ft. in diameter, the stiff, sturdily-stalked leaves with blades 5 ft. long. This palm ought to be hardy in the mild south-west counties of Britain. The

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* **Nannorhops Ritchieana,** *H. Wendland* in Bot. Zeitung 1879, p. 148; Aitchison in Journ. Linn. Soc. xix., 140, t. 26. A gregarious tufted low-growing glabrous palm, with prostrate branching robust rhizomes or stems. Leaves cuneately flabellate, rigid, plicate, split into curved 2-fid segments; petiole short. Spadix interfoliar much branched; spathes tubular sheathing, spathels ochreate; flowers polygamous. Calyx tubular, membranous, unequally 3-lobed. Corolla 3-partite, segments valvate. Stamens in hermaphrodite flowers 6, in male about 9. Ovary trigonous; style short, stigma 3-toothed; ovules basilar. Drupe small, globose or oblong, 1-seeded, style basilar. Seed free, erect, ventrally hollowed; hilum small, albumen equable; embryo dorsal or sub-basilar. Beccari and Hook. f. in Flora of British India, Vol. vi., p. 429.

A native of Sindh, the Western Punjab, Afghanistan.

NANNORHOPS RITCHIEANA.

[*To face page* 290.

TRACHYCARPUS TAKIL.

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other palm of which an illustration is given is *Trachycarpus Takil*, Beccari,* also from N. India. It is a close ally of the hardy *T. excelsa*, but easily recognisable by its different port and by the closer, neater fibring of the trunk.

A visit was made to the School of Horticulture at Cascine on the outskirts of Florence. An interesting branch of activity here is the hybridisation and improvement of Anthuriums, especially of the red-spathed section. A group showing some of the best results secured a first prize at the recent International Show at Chelsea. Another interesting culture is that of Camellias in the decomposed wood of *Castanea sativa*. This material, regarded here as a substitute for peat, is the brown, fungus-killed wood one sees in hollow trees, and Camellias, which will not grow in the ordinary soil, thrive well in it. *Acacia dealbata* also fails in the ordinary soil and is grafted on *A. longifolia* which succeeds in it. An extensive pinetum is maintained containing many admirable specimens, among them Monterey Cypress (*C. macrocarpa*), girthing 11 ft. 4 in., and a large specimen of the fastigiate *Cephalotaxus pedunculata*, the lower part of which had reverted to the ordinary spreading type. As street trees in this part of Florence I noted *Celtis australis* with its clean trunk like a beech, and *Melia Azedarach*, still retaining much fruit.

Boboli Gardens, Florence.

These gardens are deserving of a visit because they represent the typical gardens of Italy. They are attached to the Royal Palace of Tuscany, but since the unification of Italy under the House of Savoy, neither the Palace nor the Gardens have been much used by the Royal Family; they are open to the public on certain days. Situated on the slope of a hill they give from the summit many striking views of Florence and the surrounding country, the most distinctive feature of which are the grey olive-clad hills out of which stand the dark spires of Cypress. The gardens themselves show many features of peculiar interest, added to which is the charm which age and associations alone can give. We are accustomed to regard Versailles as the first, as well as the grandest, exposition of its peculiar type. But that the ideas which gave it birth existed a century previously is shown by these Boboli Gardens at Florence,

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* **Trachycarpus Takil,** *Beccari.*—Caudice robusto elato e basi obliqua cito ascendente erecto, foliorum vaginis reticulo arcte induto, filamentis liberis pannosis fere destituto; vaginarum appendicibus liguleformibus triangularibus brevibus in gemma terminali erectis; frondibus omnibus persistentibus, inferioribus marcescentibus, limbo ¾ orbiculari in laciniis numerosis (45–50) ensiformibus breviter bifidis vel bidentatis profunde et irregulariter partito; spathis tenuiter membranaceis superioribus inflato-ventricosis; floribus masculis globoso-trigonis, calyce parvo; corolla quam calyce subtriplo longioro; staminibus quam corolla conspicue longioribus; floribus foemineis glomerulato-2–4-nis, pedicello brevissimo suffultis; ramulis floriferis inconspicue papilloso-puberulis vel glabrescentibus; fructibus transverse reniformibus profunde umbilicatis, stigmate prope apicem excentrice et fere laterali, endocarpio tenui. Beccari in Webbia, i., p. 52.

This palm, allied to *T. excelsa* and *T. Martiana*, is found in N.E. Kumaon, where, according to Duthie (Gardeners' Chronicle, 1886, i., p. 457), the natives call it "Thákil," from which "the mountain called the Thákil to the south of Phithauragarh is named." Duthie, however, regarded it as *T. Martiana*.

founded as they were in the middle of the 16th century. There is the same predilection for straight lines, tall clipped hedges, broad gravel walks and statuary. But there is one thing that gives the Italian Gardens a very distinctive character, which is the prevalence of the spire-like, fastigiate form of *Cupressus sempervirens*. Here there is a splendid avenue of them over 300 years old, some of the trunks being over 6 ft. in girth. The Holm oak is much used to form hedges and in its natural shape; in one place it is made to form the low arches of a long pleached alley. At the lower side of the garden there is a pleasing old-time arrangement of formal box-edged beds and statuary surrounded by water.

Naples.

The most important public place for tree study in Naples is the Villa Nationale, a park and promenade stretching along near the sea at the west end of the town for two-thirds of a mile. It was originally laid out in 1780, and there are in places some finely grown trees. This was the most southerly point I reached, and the latitude was indicated by the character of the trees and shrubs grown, which were of a more subtropical character than I had seen either at Florence or Rome. Among palms, *Sabal Blackburniana* was in robust health; a group of 14 examples of *Washingtonia robusta* with their uniform circular stems suggest the columns of a Greek temple; besides the common *Phoenix canariensis* there is a fine specimen of the date palm 50 ft. high. *Strelitzia augusta* was in flower; *Grevillea robusta* was 50 ft. and *Casuarina equisetifolia* 20 to 30 ft. carried enormous crops of persistent cone-like fruits, $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long. An *Erythrina*, probably *E. Caffra*, 30 ft. high, had a trunk 2 ft. in diameter. *Agave potatorum* was in flower, as was also *Acacia longifolia* 30 ft. high. The branches of *Cercis Siliquastrum* were simply cylindrical masses of blossom. The value of Holm oak as a sea-side shelter tree (apparent enough in some of our south coast resorts) was very evident here. Of three rows of trees, those on the outside are within 20 yards of the sea, much battered and tilted over from windward; the middle row shows the same influences to a less degree, whilst those of the third row are practically normal in growth and shape. With so many interesting trees available for the purpose, the use of common *Robinia Pseudacacia* as an avenue tree in this climate can scarcely be regarded as an inspiration, the trees (in full flower on April 12th) have a thin meagre aspect. Among the plants used for bedding are Cinerarias and *Clivia miniata*.

La Floridiana, Naples.

Through the kindness of Sir Schomberg K. McDonnell I obtained an introduction to the garden at La Floridiana. The villa was built by one of the Bourbon Kings of Naples—a white house situated in the Vomero district and conspicuous from Lower Naples in its setting of dark green vegetation. It is now owned by Mrs. Harrison whose keen interest in her garden makes it probably the most beautiful and admirably managed in Naples. From its elevated site glorious views are to be had of the sea with the islands of Capri and Ischia in the distance, of Vesuvius, and the coast line of the

bay to Sorrento. In this garden I had the good fortune to see the finest examples of stone pine (*Pinus Pinea*) I had found. This tree is, of course, one of the characteristic trees of Italy made familiar to us in innumerable drawings and paintings, but rarely, so far as I could judge, is it so fine as here, where several of its towering columnar trunks, crowned with a dark spreading mass of branches and foliage, show to perfection against the sky. A notable tree growing near the house is a Carob (*Ceratonia Siliqua*) with a trunk 3 to 4 ft. in thickness. Of rarer trees is a very good example of *Pinus leiophylla*, one of the *Montezumae* group of pines, with five leaves in a bundle, native of Mexico; its thick, pendulous masses of pale grey, almost thread-like foliage, are very striking. There is also an admirable tree of *Araucaria Bidwillii*. Many of the plants noted elsewhere are, of course, growing here also, such as *Pittosporum Tobira*, *Chamaerops humilis*, fine masses of Camellia and *Juniperus drupacea*, always in great perfection. A hedge of blood-red *Rosa indica* I was too early to see, but in a few weeks later it must make a wonderful display. The grounds cover some 20 acres but are so admirably disposed that they seem much larger. There is no formality, and the grounds are traversed by winding walks, canopied in many places by the branches of Holm oak, Aleppo pine and other trees. In many places an exquisite green carpet of thick moss covers these shaded walks—as good to walk upon as the richest Persian carpet.

Bologna and Padua.

Both these cities possess small botanic gardens of ancient foundation; that of Padua is said to be the oldest in Europe, dating back to 1545. At Bologna the most remarkable tree in the garden is *Liquidambar orientalis*, which we only know in England by a few specimens under 20 ft. high. The tree at Bologna is probably 90 to 100 ft. high, and its trunk at the base is over 5 ft. in diameter, slightly buttressed. It dominates the garden. There are also admirable examples of *Taxodium distichum*, *Celtis occidentalis* 60 to 70 ft. high, *Gymnocladus canadensis* 50 ft., *Elaeagnus orientalis* 40 ft., *Koelreuteria paniculata* nearly as high, *Paulownia imperialis* 50 ft., *Pistacia Terebinthus* 30 ft., and *Vitex Agnus-castus* a rugged, picturesque, small tree 12 ft. in height and width. The fine development of all these trees indicates that they exist under a more eager sun than ours. Yet we have our compensations. *Aucuba japonica*, for instance, leads an unhappy career in a pot under glass, and the numerous ericaceous and other evergreens that give warmth to our gardens in winter are not to be seen.

A still larger selection of fine trees is to be seen at Padua, indeed I know of no spot so small in extent that contains such a variety of finely developed individuals. The greatest diameter of the garden does not exceed 250 yards, in places it is about 100 yards across, and a considerable part is given up to arrangements of herbaceous plants and to glass houses. Many of the trees, according to their labels, were planted in 1760, but one Oriental plane dates from 1680. Its trunk is 29 ft. round at the base, but through internal decay is now a shell merely. Among American trees *Liriodendron Tulipifera* is 90 ft. high; black walnut has a trunk

4 ft. in diameter; *Fraxinus juglandifolia* and *F. epiptera*, both forms of American white ash, 90 to 100 ft. high, the former 12 ft. in girth; *Carya olivaeformis* is a really splendid example 100 ft. high, its handsome, finely buttressed trunk 3 ft. in diameter. A tree labelled *Diospyros Lotus* 90 ft. high looked extremely like *D. virginiana*, its trunk 2 ft. in diameter covered with rugged chequered bark exactly like that of the famous tree of the latter species near the Sun Temple at Kew. Several specimens of *Lagerstroemia indica* are 20 to 30 ft. high, well marked by their clean smooth trunks. This tree must be one of the great features in Italian gardens when in bloom later in the season. *Magnolia conspicua* is 40 ft. high; *Cephalotaxus pedunculata* 30 ft.; and *Hibiscus syriacus* only a few feet less in height. These are but a few of the more noteworthy trees (there are for instance admirable examples of *Ginkgo* and deciduous cypress) but they serve to show that this charming old garden at Padua is well worth inspection. I think it is a mistake in the management to allow so many trunks to be covered with ivy. It is not that it does harm, that I believe only happens when the ivy reaches the leafy part of the tree, but where so unusual a number of trunks of exotic trees are to be seen in characteristic beauty as at Padua, it is a pity to let them be hidden by ivy.

The herbaceous garden is circular and surrounded by an ancient wall entered by two fine gateways. The plants themselves are arranged in a series of square compartments usually about 3 ft. across formed by stone edging, one plant or clump in each plot. In April the stone was much more in evidence than the plants.

Abbazia (Istria).

This little town is situated on the E. coast of Istria at the N. end of the bay of Quarnero and may be reached in 45 minutes by steamer from Fiume. It is now a fashionable health resort especially for the Viennese, and in the Angiolina Park a well-kept garden is maintained. This park is situated close to the shores of the Adriatic and appears to have been originally completely covered with wild bay-laurel (*Laurus nobilis*). The ground is hilly and rocky, and in the wilder parts much of the apparently primaeval bay-laurel still remains, often in dense thickets 50 ft. high. Winding through these thickets and amongst enormous boulders pleasant shady walks have been made. The mean winter temperature is 50° Fahr. and many plants, tender with us, are thriving here. Thus, *Trachelospermum jasminoides* makes a mass on a lawn 10 ft. through and 5 ft. high: an extensive group of *Beschorneria* was sending up numerous spikes of red flowers; trees of camphor are 50 ft. high, and various Agaves, Opuntias and Dasylirions are succeeding. The vegetation as a whole is very luxuriant, and as money is evidently plentiful there is no reason why this place with its beautiful situation and equable climate should not in time rival the Mediterranean resorts. The management appears to be alive to the desirability of increasing the attractiveness of the gardens for numerous small plants of new subtropical species had apparently been recently obtained. *Ophiopogon japonicum* is used more or less

in nearly all the gardens I visited for forming edgings and as a low green covering for the ground, here perhaps more extensively than elsewhere. Where grass will not grow it makes probably as good a substitute as anything obtainable, in appearance, at any rate, suggesting a coarse herbage.

The Dalmatian Coast.

Starting from Trieste on one of the various steamers by which one may go as far south as Cattaro, rounding the peninsula of Istria and touching at various coast towns and islands on the Adriatic, I had an opportunity of seeing the gardens at Trieste, Spalato, Ragusa, Cattaro, Abbazia and Fiume, and occasionally of seeing the native vegetation as well.

On the whole the ornamental gardening of this part of Austria-Hungary cannot be compared with that of the French and Italian Riviera or that of Lake Maggiore, in the use of exotic trees and shrubs. There is, however, enough to show that, given the will and the means, the best gardens of the Mediterranean region might be rivalled. It is, of course, chiefly a matter of money and skill. At present comparatively few English people visit it, but efforts are, I believe, to be made by the steamship companies and others to bring the beauties of this coast into greater prominence. In association with these efforts it would pay the local authorities of the more important towns to engage men trained in the Riviera to superintend the public gardens and to introduce the plants which add so much to natural attractions, even on the N. Mediterranean littoral.

As showing the nature of the climate at Ragusa, for instance, there may be mentioned a group of *Washingtonia robusta* 40 to 50 ft. high, fine Oleanders, *Pittosporum Tobira*, *Eucalyptus globulus*, the variegated *Yucca aloifolia*, Opuntias, *Cycas revoluta*, and the Loquat fruiting freely. An interesting feature of the streets are old trees of white mulberry with rugged trunks 2 ft. 6 in. in diameter. On the cliffs about the town *Agave americana* appears to be naturalised: its tall flower-stems, in various stages of development or decay, standing out against the sky, form one of the most lasting mental pictures the visitor carries away from Ragusa.

On the hills behind the town the landscape was enlivened with the flowers of a shrubby broom-like plant—*Calycotome infesta*, a close ally of Cytisus and Genista, bearing its yellow, pea-shaped blossoms in great profusion. This shrub (too tender for our gardens) is, as its specific name suggests, regarded as a pest more than anything else in Dalmatia, its long, stiff, sharp spines impeding in many places the progress of man and beast.

At Gravosa (the port of Ragusa) one saw the Oriental plane in something like its native splendour. Not far from the quay is an immense tree with a trunk 6 ft. in diameter near the base, and clear of branches for 20 ft. up.

Close to Ragusa and within half an hour's row is the Isle of Lacroma, worth visiting for the sake of the rich native vegetation that covers it and for the old gardens attached to the monastery of San Marco—a 12th century foundation. The native plants make a dense thicket all over the island, scarcely penetrable in many places.

Most in evidence were Myrtle, *Pistacia Lentiscus*, *Erica arborea*, *Viburnum Tinus*, *Juniperus drupacea*, *Phillyrea media*, *Andrachne Unedo*, Cistuses, *Lonicera Etrusca* forming tangled masses, *Spartium junceum*, etc. Taller trees were chiefly *Quercus Ilex*, *Cupressus sempervirens*, *Laurus nobilis*, and the Aleppo Pine (*Pinus halepensis*).

The gardens round the monastery (once fitted up as a chateau and occupied by the late Crown Prince of Austria) are now neglected, but interesting for their old world air and for the untrammelled grace and luxuriance of growth which only neglected gardens show. On the abandoned terraces at the outskirts the native vegetation is rapidly resuming its sway. The still cared for parts of the garden consist chiefly of walled in enclosures, over the walls of which yellow and white Banksian roses clamber in unrestrained profusion. The plants growing in the borders were in keeping with the place: old oleanders and olives, *Chamaerops humilis*, hedges of rosemary and box, peonies, oranges, very old carobs (*Ceratonia Siliqua*), and such like. A touch of modernity is given by an excellent specimen of *Acacia cultriformis*, and the N. Asiatic flora was represented by numerous plants of *Pittosporum Tobira*, some 25 ft. high, and by beautiful specimens of *Spiraea cantoniensis fl. pl.*, whose long arching sprays were wreathed with pure white flowers.

A Day in Montenegro.

Neither at Cattaro nor at Cettinje, the capital of Montenegro, is there much gardening to see, and the native vegetation on the road between the two places is very scanty. The road ascends to over 4000 ft., in climbing which one experiences of course the interesting transition from warm temperate to cold temperate and alpine conditions, and sees some of the most beautiful scenery in Europe. Unfortunately the country is so barren and rocky that the number of plants by the roadside is much reduced. At sea-level near Cattaro are growing figs, oranges, white mulberries, olives, myrtles and other plants indicative of a generous climate. Further up come *Petteria ramentacea*, *Spartium junceum*, both well known in English gardens, as well as *Calycotome infesta*, here as at Ragusa the gayest shrub in flower. In one place vast stretches of *Euphorbia Wulfenii* painted the mountain sides yellow. Approaching the summit of the pass the woody vegetation is reduced to common juniper and occasonally scrubby specimens of oak and beech, whilst in crevices between the stones grow primulas, hepaticas, violas and other alpines. In sheltered hollows far from the road woods of pine trees—probably some form of *P. Laricio*—are to be seen.

Most interesting of all are the small patches of cultivated ground the Montenegrins have managed to obtain by clearing off the stones. These patches are usually in hollows into which a scanty humus has settled, and many of them are only 4 or 6 yards across—strange little oases in a wilderness of stone. Judging by the old haulm, potatoes appear to be a chief crop. I should imagine the country between the Austrian frontier and the outskirts of Cettinje to be about as difficult to wrest a livelihood from as any in Europe. Only here and there does a meagre tree or patch of scrub relieve the vast rugged expanse of rock. The poverty of the country is

indicated by the thatched hovels in which the people live, floored with mud and often shared by fowls and animals. But the people themselves give no indication of being borne down by their condition. They are a tall upstanding race, reflecting in their bearing their long and triumphant fight for freedom and independence.

At Cettinje, which stands on a plain at something over 2000 ft. surrounded by mountains, the land becomes more fertile. The vegetation was about as far advanced as it was in England a month previously ; that is to say, the buds of most things were only just bursting, others had not stirred from their winter rest. The chief cereal appeared to be rye. A small public garden of little interest stands at the S.E. end of the town ; in this were used only trees and shrubs commonly planted in England, such as poplars, elms *Robinia*, common spruce, cherry, etc., none of notable size.

Spalato.

Returning northwards to Spalato I found a rather interesting variety of trees planted in the streets : white mulberry with its rugged trunks, the heads being pruned back annually. *Gleditschia caspica*, *Broussonetia papyrifera* quite abundant as a shapely small tree on the road to Salona and laden with twisted catkins, *Celtis australis*, always distinguishable by its neat rounded heads and clean smooth trunks, and a few *Melia Azedarach*. The climate of Spalato is probably not so favourable as that of Ragusa, but no effort is made to beautify the place with the many delightful plants that might be used. The presence of vineyards, fine loquats heavily in fruit, *Cupressus sempervirens* and enormous bay-laurels show that a very large selection of trees and shrubs is available for use, but the Stadt Park is largely filled with Norway maple, lime, plane and *Acer Negundo* amongst deciduous things and among evergreens by the eternal *Euonymus japonicus* (very mildewy), *Biota orientalis*, the commonest and usually the only member of the *Thuya* group on this coast, and Aleppo pine very luxuriant and forming large plumose masses. Of more interest were *Cephalotaxus pedunculata* 20 ft. high and *Ligustrum lucidum* 35 ft. high and quite a tree. On the road to Salona Christ's Thorn (*Paliurus australis*), is used as a fence.

XXXIV.—COTTON.

The improvement of cotton by means of hybridisation has long been the subject of numerous and careful experiments on the part of the officers in charge of Botanic and Agricultural Stations in India, Egypt and our Colonies. The subject, however, is attended with difficulties of a very serious character which are mainly due to uncertainty as to the types used for hybridisation. In most cases pure races can only be detected or separated after years of laborious work owing to the extent to which promiscuous hybridisation has taken place, either by accident or design, during long years of cultivation. Another difficulty almost equally serious is that connected with the supply of seeds from the Experimental Stations.

A good hybrid cotton may be raised as a first cross, and from the seed distributed an excellent yield may be obtained. In those countries where the ginning of the cotton is entirely in the hands of the Government Departments concerned it is possible to arrange that only good seed shall be issued from year to year in return for the cotton sent in to the ginnery, and the deterioration in the quality of the cotton, which is liable to occur with the continuous cultivation of the offspring of hybrid plants, can thus be avoided. Where, however, ginning is not centralised and the peasant proprietor runs his own hand gin, or where the ginning is done by local communities as obtains in India, N. Nigeria and elsewhere, the difficulties in the way of attempting to improve the races of cotton under cultivation may be well nigh insuperable. This side of the problem is not the one which concerns us here at the present moment ; the object of this note being to draw attention to a very important series of experiments in cotton hybridisation on proper scientific lines which is being carried out by Mr. H. M. Leake, Economic Botanist at the Agricultural College, Cawnpore, India. A detailed account of these experiments has been published in the "Journal of Genetics," vol. i., p. 205 (Cambridge University Press), but the following abstract account of Mr. Leake's work is taken from the "Annual Report of the Board of Scientific Advice for India" for the year 1910–11.

"Several papers on this [the cotton] crop have appeared during the year of which the most important are those of Leake relating to the work on cotton breeding at the Cawnpore Experiment Station. The cotton investigations in progress at this centre are concerned with the production and the subsequent introduction into general cultivation of an improved type suitable for the western cotton growing tracts of the United Provinces. The papers published during the past year give an account of the progress made up to the present time and also outline the scheme of future work. While the direct results likely to be obtained from these investigations chiefly concern the Province concerned, nevertheless both the methods adopted in the investigation and the ideas underlying the work are of much more general application and will be studied by all concerned with the improvement of cotton in India.

"A popular account of this work was issued as a pamplet at the recent Allahabad Exhibition and reprinted in the *Agricultural Journal of India*. The present cotton crop of the Western Districts of the United Provinces consists of a confused mass of types which have been referred by Gammie to a single species *Gossypium neglectum*, Tod. All the forms are characterised by short and coarse lint and are entirely unsuitable for use in England or for any commercial purpose beyond the coarser kinds of cotton goods. Other forms of cotton also occur in these Provinces, but no indigenous type is met with a silky texture suitable for spinning between thirty shillings and forty shillings which it is the object of these investigations to produce. It is considered that the simple selection is not likely to be of much service in finding the type required, but practical results are expected from hybridisation. In the first place the red flowered late *Nurma* cotton with long staple has been crossed with the short stapled silky form of *Bani* found in

the United Provinces. In this cross the long staple and red flower of *Nurma* have been combined with the early flowering and silkiness of fibre of the *Bani*. In the second case, the long staple and red flower of *Numa* have been united to the high lint percentage and earliness of white flowered *Desi* cotton. The reports on the fibre of the new forms are very encouraging, and in one case the sample was valued at Rs. 50 a candy more than fine Cawnpore machine ginned and was considered equal to fine Broach. Other crosses are now being made and it is hoped that these will add still further improvement. The second stage of the work after the production of an improved cotton is to introduce it into general cultivation and to maintain the quality. For this purpose a seed farm is being started near Aligarh from which it is hoped to produce enough seed to sow one thousand three hundred acres in one year producing five hundred bales (of four hundred pounds) of cotton. The cultivators growing the one thousand three hundred acres of cotton will each year receive a fresh supply of seed from the central farm while their crop will be separately ginned and the seed distributed to a second series of cultivators controlling twenty thousand acres of land under cotton. In this way it is hoped a series of waves of cotton seed emanating from the seed farm will be started which will in a short period establish the crop on a firm basis.

"The student of plant breeding will find a detailed account of the Cawnpore cotton experiments in the *Journal of Genetics* (vol. i., p. 205), while an abstract has appeared in the *Proceedings of the Royal Society*. The inheritance of several of the characters of cotton have been worked out in detail and especially the colour of the corolla, the red colouring matter of the sap, the degree of incision of the leaf, the type of branching, the length of the vegetative period and the leaf glands. Several instances of correlation of character have been observed, two of which are of great interest. The forms with a majority of sympodial secondary branches are early flowering, while in those like *Nurma*, characterised by monopodial branching, the vegetative period is prolonged and no fruit is formed until the tertiary branches are developed. It is essential that plants should be of the sympodial type if their cultivation in the United Provinces is to be a commercial success, for the late flowering monopodial forms do not flower in time to give a crop before the winter sets in. At the same time the majority of Indian cottons with a valuable staple belong to the monopodial forms. It has therefore been necessary to resort to hybridisation in order to produce a new set of early flowering forms of sympodial habit, but bearing the long staple of the monopodial type. The second important correlation discussed is that between the presence of red colouring matter of the sap and an increase in the length of the vegetative period. When the red colour is present, there is a distinct retardation of the commencement of flowering.

"One of the chief difficulties in the production of a new and improved type of cotton and in the maintenance of the seed supply arises from the fact that cottons readily cross-fertilize in India as in other countries. During the preliminary breeding and selection operations it is necessary to protect the flowers from foreign pollen,

and to work entirely with self-fertilized seed. This circumstance adds greatly to the labour involved in the work, and also entails as a preliminary the isolation of pure lines from the mass of splitting forms (which make up the bulk of the cotton crop of India) before crossing can be begun. Further, an improved type will have to grow separately, and every care taken to keep the seed supply pure and to prevent any degeneration taking place as a result of vicinism. These aspects of the subject have been dealt with at Cawnpore and the results incorporated in an interesting paper in the *Memoirs of the Agricultural Department of India* (*Botanical Series*). During the progress of this work it was observed, both in the pure types and in the crosses, that some of the cultures carried on from year to year by means of self-fertilized seed exhibited varying degrees of sterility. These matters, however, were not for various reasons thoroughly worked out, but it is hoped that opportunity will be found to investigate them more fully in the future. As regards the method by which crossing takes place between different types of cotton, the authors consider that most of the crossing takes place between neighbouring plants, and that a distance of ten feet between the various plots is sufficient to greatly reduce, if not to prevent, it altogether. If these observations are found to apply to other cotton-growing tracts in India, one of the difficulties in maintaining a pure seed supply for distribution to cultivators will have been removed. It is now generally recognised that the degeneration which results when improved conditions are introduced into a new country is largely a result of vicinism. The exotics, in the first place, are often a mixture of types which cross among each other, while further degeneration results from crossing and admixture with local sorts. It is more than probable that the want of success in introducing foreign cottons into India in the past has been mainly due to natural cross-fertilization. It is possible, therefore, that if the work of introduction is properly carried on in the future considerable success might easily be obtained in this direction."

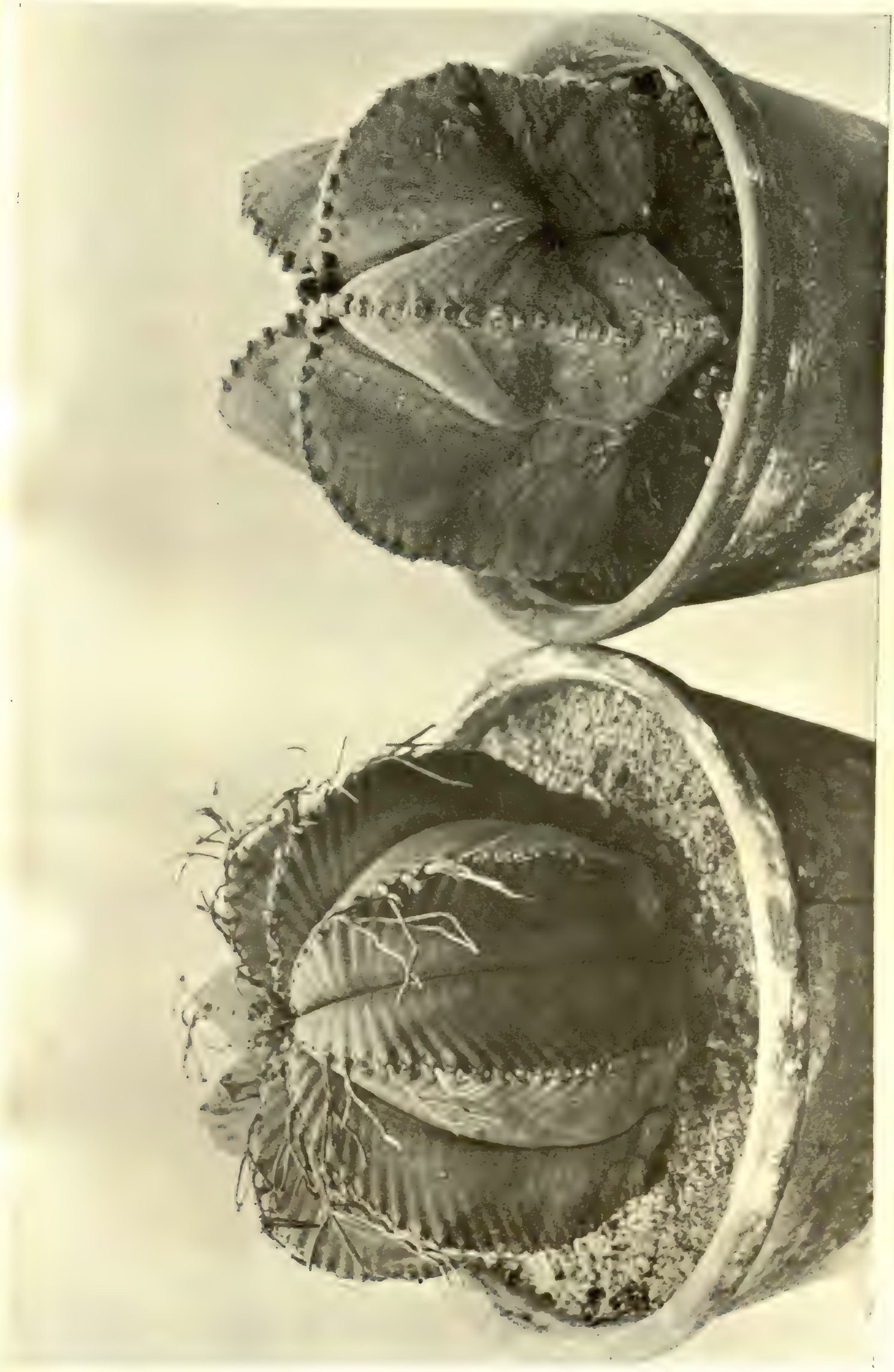
Attention may also here be called to the "Papers and Reports on Cotton Cultivation" presented to the International Congress of Tropical Agriculture, Brussels, May, 1910.

XXXV.—MISCELLANEOUS NOTES.

Colonial Appointments.—We learn that Mr. S. Simpson has been appointed Director of Agriculture, Uganda, in succession to Mr. P. H. Lamb, who has been appointed Director of Agriculture, Northern Nigeria.

We also learn that Mr. F. Evans, Curator, Royal Botanic Gardens, Trinidad (*K.B.*, 1903, p. 31), has been appointed Assistant Superintendent in the Agricultural Department, Southern Nigeria.

Harry Dodd.—It is with great regret that we have to record the news of the death of Mr. H. Dodd, in India, on July 3rd, conveyed to us through the India Office.



ECHINOCACTUS ORNATUS.

EUPHORBIA MELOFORMIS.

[*To face page* 300.

CYCAS MICHOLITZII.

To face page 301.]

Mr. Dodd entered Kew as a young gardener in March, 1904, and left in July, 1906, to take up the post of Curator at Onitsha, Southern Nigeria. Before coming to Kew he spent some three years in the Liverpool Botanic Gardens.

He resigned this post in West Africa in June, 1910, at the close of his fourth year of service, partly with the object of obtaining a post in the East.

In February, 1911, Mr. Dodd was appointed a probationer gardener in India; and, after spending some time at the Royal Botanic Garden, Calcutta, was transferred to Delhi, where he died of enteric fever on July 3rd.

Euphorbia meloformis, *Ait.*—This is one of the most remarkable of the South African species of Euphorbia, and, as seen from the photograph here reproduced, bears so great a resemblance to *Echinocactus ornatus* from Mexico, that a non-botanist would probably never suppose that they belonged to two totally different Natural Orders.

There are two species in cultivation under the name of *E. meloformis*, but the specimen here figured is the true plant of Aiton, and was originally introduced into this country by Masson in 1774. It is a native of the region extending from the districts of Uitenhage and Port Elizabeth to that of Albany, in South Africa. The specimen figured measures $5\frac{1}{2}$ inches in diameter, and has probably nearly or quite attained its full size. It is a male plant, as is indicated by the persistent cymes, which generally fall away from the female plant—at least so far as I have seen. The female plant is very rare in cultivation; the peduncles are shed after flowering, and I have not seen it bear fruit. N. E. B.

Cycas Micholitzii.—The history of this remarkable Cycad has been given in *Kew Bulletin*, 1910, p. 163, and in the Bot. Mag., t. 8242, where the male plant is the subject of an excellent figure. A considerable number of plants of this species were imported by Messrs. Sander, but with the exception of the female plant depicted on the right side of the accompanying illustration, all have so far proved to be male. This plant first coned in the winter of 1910, and has continued to do so annually since. The male plant matures its cones somewhat earlier than does the female plant. An effort to obtain seeds was made in 1910; pollen was saved and the ovules were dusted periodically. A number of ovules swelled up to over an inch in diameter and were allowed to mature, but on examination they all proved to be hollow. This false fertilization and swelling up of the ovules is quite common in many cycads under cultivation. In some cases the young seed may contain a mass of endosperm, but the embryo is absent, whilst in others it is quite hollow. At the present time the Kew specimen is again bearing a number of what are apparently good seeds; it remains to be seen whether they may be fertile. The Kew specimens have improved considerably under cultivation in tropical stove conditions. During the summer months they have been watered and syringed frequently, and during the autumn and winter months kept on the dry side, giving only just enough water to enable them to retain the leaves. The largest

number of leaves borne by a plant has been four, but the usual number is one or two. These are erect and arching at the top, the largest being about eight feet in length. The pinnae are reduced to spines in the lower half, those of the upper half dichotomously branched and varying from three to twenty inches in length, glaucous when young, glabrous and dark green when adult, and more or less undulate. The male cones are bright yellow in colour and from six to nine inches long. The female cone consists of about fifteen pectinate-pinnate carpellary leaves, the longest of which are about six inches, and some two to three inches broad, and bearing from one to four deep green ovules; these are now about one-third of an inch in diameter, and occasionally swell up to about an inch, changing to dull yellow when mature. The scale leaves are comparatively few in number, two to three inches in length, reddish-brown in colour, and, unlike those of the majority of Cyads, are completely deciduous. The stem is naked except in the upper few inches, dull pinkish-red in colour, tapering from below upwards, and more or less gouty.

C. P. R.

Botanical Magazine for July.—The plants figured are *Agave marmorata*, Roezl (t. 8442); *Erica ciliaris*, Linn. (t. 8443); *Styrax Wilsonii*, Rolfe (t. 8444); *Cotyledon subrigida*, Robins and Seaton (t. 8445); and *Pseuderanthemum lilacinum*, Stapf. (t. 8446).

The Agave was originally collected by Roezl in the Province of Tehuacan, Mexico, and the plant figured was raised from a bulbil produced on one of the original plants in Lady Hanbury's garden at La Mortola in 1904. The plant illustrated flowered at La Mortola in June, 1911.

A. marmorata appears to be most closely allied to *A. Willdingii*, Tod. The flowers are small and bright yellow, so that it cannot be placed in Baker's group *Americanae*.

The form of *Erica ciliaris*, which is the subject of the plate, is one which is found in Portugal, where also the more commonly known form—native in Dorset, Cornwall and Galway—is also found This form was first noticed by Mr. G. Ward in Portugal in 1872. It has a more compact habit of growth, and its flowers are not secund as in *E. ciliaris* proper. It was re-introduced in 1882 by Mr. Backhouse as *E. Maweana*. The plant thrives at Kew, and makes a bright display of colour from July to October.

Styrax Wilsonii is a compact shrub most nearly related to *S. japonicum*, but about half the size of that plant in all its parts. The plant figured was raised from seeds presented to Kew by the Arnold Arboretum and collected by Mr. Wilson in China in 1908. The shrub flowered when only seventeen months old, and it is as yet uncertain whether it is quite hardy at Kew.

The *Cotyledon* is a remarkably handsome species, a native of Mexico, for the plant of which we are indebted to the authorities of the Natural History Museum at Washington. *C. subrigida* was discovered in 1892 by Mr. C. G. Pringle on ledges of cliffs in the Tultenango Cañon. A plant was sent to Kew in 1905, where it flowered vigorously in the Succulent House in October, 1911.

Pseuderanthemum lilacinum, a native of Selangor, was received at Kew in 1909 from Mr. H. N. Ridley under the name *Eranthemum Teijsmanii*. The plant is, no doubt, closely related to *E. Teijsmanii*, described by Clark in the materials for a Flora of the Malayan Peninsula (*P. Teijsmanii*, Stapf.), but it differs especially in being an erect shrub some three feet in height. It is a very suitable subject for a Tropical House.

Flora Capensis.—The issue of the concluding part of the first section of Vol. V. of this work, edited by Sir W. T. Thiselton-Dyer, has now to be recorded. The section includes 747 pages, and has appeared in four parts, the dates of publication of which have been as follows :—

Part I., pp. 1–224, was published *June*, 1901.
Part II., pp. 225–448, was published *May*, 1910.
Part III., pp. 449–640, was published *January*, 1912.
Part IV., pp. 664-end, was published *June*, 1912.

The orders dealt with are the remaining Bicarpellatae—Acanthaceae—Plantagineae and Monochlamydeae—Nyctagineae—Proteaceae.

The Editor's Preface, in which the history of the production of this important volume has been given in detail, is reproduced below:—

"On the completion of Volume VII. the preparation of Volume IV. was taken up. Professor Francis Guthrie and Dr. Bolus undertook in South Africa the elaboration of *Ericaceæ*. Meanwhile, with the aid of contributors whom I was able to enlist at home, a commencement was made with the present volume, and the first part was published as long ago as 1901. Unhappily the death of Professor Guthrie in 1899 and the failing health of Dr. Bolus left their contribution unfinished, and it had to be continued and completed at Kew. It became impracticable to make any further progress with Volume V. till the two sections of the preceding one had been disposed of.

"In a vast undertaking like the present, the progress of which is necessarily protracted, it is the inevitable but melancholy task of the Editor to record the loss from time to time of those whose generous assistance and co-operation have made its ultimate accomplishment possible. That it should be so must be his justification for the somewhat erratic mode of publication which he has felt obliged to adopt. Particular orders have been as far as possible entrusted to those who had made them a special study. Had he waited to invoke their aid in following a continnous sequence, that aid would in at least two cases have been unavailable and with difficulty replaced.

"Charles Baron Clarke, M.A., F.R.S., died 25th August, 1906; he elaborated *Commelinaceæ* (1897), *Cyperaceæ* (1898), and *Acanthaceæ* (1891) in the present volume. (Obituary notice and bibliography, *Kew Bulletin*, 1906, pp. 271–281.) Maxwell Tylden Masters, M.D., F.R.S., died 30th May, 1907; he

worked out *Restiaceæ* for the *Flora* in 1897. (Obituary notice and bibliography, *Kew Bulletin*, 1907, pp. 325–334.) Dr. THEODORE COOKE, C.I.E., F.L.S., on the completion in 1908 of his Bombay Flora on which he had been engaged for ten years, volunteered his aid for the *Flora Capensis*. He rendered great service by filling up many gaps in the present section undisposed of at the moment. I had hoped to receive from him more extended contributions, but while occupied on *Amarantaceæ* he was seized with illness which terminated fatally on 5th November, 1910. (Obituary notice, *Kew Bulletin*, 1910, pp. 350–352.) The death of HARRY BOLUS, D.Sc., F.L.S., in England on 25th May, 1911 (obituary notice, *Kew Bulletin*, 1911, pp. 275–277), is something more than the loss of a contributor of specialized accomplishments. In his knowledge of the South African flora it may be said with confidence that Dr. BOLUS had no living rival. I cannot do better than quote a few words from Professor PEARSON'S penetrating appreciation of his work and character (*Kew Bulletin*, 1911, pp. 319–322):—'By common consent Dr. BOLUS occupied a unique and honoured place amongst botanical workers in South Africa. His death removes one of the most strikiug figures from the ranks of her scientific men, and leaves a vacancy which no man can fill. In the annals of South African Botany his name and his record will be written in large characters.' Dr. BOLUS took more than a keen interest in the progress of this work. As has been acknowledged in previous prefaces, Kew has received from him a continuous stream of fresh and novel material. Nor can it be doubted that his position and reputation in South Africa weighed with the Legislature of Cape Colony in inducing it to make successive grants in aid of its preparation and publication. Having during his lifetime endowed the Chair of Botany in the South African College, he bequeathed to it his herbarium and library and a considerable portion of his fortune.

"From Volume IV. onwards the area comprised in the *Flora* has been extended to the Tropic. In many of the regions so included material is scanty or wholly wanting. It is therefore with no small satisfaction that I am able to record that the PERCY SLADEN Memorial Expedition (assisted by a grant from the Royal Society of London) worked between Ceres Road in Cape Colony and Lüderitzbucht in Great Namaqualand in the summer of 1908–9, and a second expedition under the same auspices, between Eendekuil in Cape Colony and Sendling's (or Bethany) Drift in the Orange River in the summer of 1910–11. The summer flora of the greater part of these regions was previously little known, and the material collected in Bushmanland and the eastern part of Great Namaqualand in the former journey and in the Richtersveld (between Ookiep and the Orange River) in 1910–11, furnishes many new records of distribution and contains a considerable number of new species.

"The Natal Government has made no contribution to the work since 1907. On the other hand, that of the Transvaal has given spontaneously a liberal grant, and this has been followed by a still more substantial one, which it is hoped will provide sufficiently for the completion of the work.

"In the present section I have been again fortunate in securing the aid of contributors who, in many cases, were able to bring to bear the advantage of previous study on the groups they undertook. Amongst these are Mr. C. B. Clarke, F.R.S., who worked out *Acanthaceæ*, and Mr. R. A. Rolfe, A.L.S., *Selagineæ*. I have had the further advantage of the continued co-operation of South African botanists. Professor Pearson has contributed *Verbenaceæ*, and I am indebted to the Trustees of the South African Museum for granting leave of absence to Mr. E. P. Phillips, one of their staff, to come to Kew to work out *Proteaceæ*, an order with which he had obtained a first-hand acquaintance in the field. The expiration of Mr. Phillips's leave left his task in some respects incomplete, and I am indebted to Dr. Stapf, F.R.S., Keeper of the Herbarium, and to Mr. John Hutchinson, Assistant for Tropical Africa, for supplementing what was needed to Mr. Phillips's work. The laborious task of elaborating *Labiatæ* was undertaken simultaneously by Messrs. Brown and Skan, and by Dr. Cooke.

"I continue to be indebted for invaluable aid to Mr. C. H. Wright, A.L.S., and to Mr. N. E. Brown, A.L.S., Assistant Keepers of the Herbarium, the former in reading the proofs and in other ways, the latter for working out the localities and distribution.

"For the limits of the regions under which the localities are cited in which the species have been found to occur, reference may be made to the Preface to Volume VI.

"Besides the maps already cited in the Prefaces to Volumes VI. and VII., the following have also been used :—

"Map of the Colony of the Cape of Good Hope and neighbouring territories. Compiled from the best available information. By John Templer Horne, Surveyor-General, 1895.

"Stanford's new Map of the Orange Free State and the southern part of the South African Republic, etc., 1899.

"Carte du Thêatre de la Guerre Sud-Africaine. Par le Colonel Camaille Favre, 1902.

"To many of the South African correspondents of Kew enumerated in previously published volumes I have again to tender my acknowledgments for the contribution of specimens in aid of the work to the Herbarium of the Royal Botanic Gardens.

"I must further record my obligations to some new contributors, and to those whose kind assistance in various ways has been of the greatest value in the preparation of this section of Volume V.

"Prof. G. Beck, Ritter von Mannagetta und Lerchenau, University of Prague. Loan of *Proteaceæ*.

"Harry Bolus, Esq., D.Sc., F.L.S., contributed many specimens, and lent portions of his Herbarium.

"J. Burtt Davy, Esq., F.L.S. Plants from the Transvaal.

"Prof. H. H. Dixon, F.R.S., Trinity College, Dublin. Loan of the *Labiatæ* in Harvey's Herbarium.

"R. A. Dümmer, Esq. Plants from Namaqualand and Cape Division.

"Prof. J. Eichler, Curator of the Botanic Department, K. Naturalienkabinet at Stuttgart. Loan of *Protaceæ*.

"Geheimrath Dr. A. ENGLER, Director of the Botanic Garden and Museum, Dahlem. Loan of *Selagineæ* and *Proteaceæ*.

"Prof. C. FLAHAULT, Director of the Institute of Botany, University of Montpellier. Collection of Basutoland Plants.

"E. E. GALPIN, Esq., F.L.S., Queenstown, Cape Colony. Large collections of South African plants and loan of portions of his private Herbarium.

"Dr. H. O. JUEL, Director of the Botanic Garden, Upsala. Loan of portions of Thunberg's Herbarium.

"Prof. C. A. M. LINDMAN, Curator of the Botanic Department of the Natural History Museum, Stockholm. Loan of *Proteaceæ*.

"Dr. J. MUIR. Specimens from the Riversdale District.

"Dr. L. PÉRINGUEY, Director of the South African Museum, Cape Town. Various duplicates and loan of specimens from the South African Museum.

"E. P. PHILLIPS, Esq., M.A. Collection of *Proteaceæ* and others.

"Mrs. R. POTT (formerly Miss R. LEENDERTZ). Plants from Transvaal.

"Prof. HANS SCHINZ, Director of the University Botanic Garden and Museum, Zürich. Large collections of South African plants and loan of specimens.

"Dr. S. SCHÖNLAND, Curator of the Albany Museum, Grahamstown. Contribution and loan of specimens of *Proteaceæ* and others.

"Prof. E. WARMING, late Director of the Botanic Garden, Copenhagen. Loan of *Selagineæ*.

"J. MEDLEY WOOD, Esq., A.L.S., Director of the Botanic Garden, Durban. Collection of Natal plants and loan of specimens.

"Dr. A. ZAHLBRUCKNER, Keeper of the Botanic Department of the Hofmuseum, Vienna. Loan of *Labiatæ* and *Proteaceæ*.

"I must allow myself more personally to express my indebtedness to Lieut.-Colonel PRAIN, C.M.G., C.I.E., F.R.S., Director of the Royal Botanic Gardens, for kind and unfailing assistance in many ways, without which the task of editing a work of this kind at a distance from the resources of Kew could hardly be accomplished.

"It has been the practice, at any rate in the more recent works that have emanated from Kew, to conform to the classification and sequence of orders adopted in BENTHAM and HOOKER'S *Genera Plantarum*. This work was not available to Professor HARVEY when he commenced the *Flora Capensis*, and he appears to have based himself on the *Prodromus* of AUGUSTIN PYRAMUS DE CANDOLLE, in the three volumes of which he was the author with Dr. SONDER. From Volume IV. onwards of the continuation the *Genera Plantarum* has been followed. There is in consequence an inconsistency between the earlier and latter portions of the work in regard to the delimitation of the sub-classes adopted, which, although of little practical importance, inasmuch as it scarcely affects the sequence of the orders, it is desirable to clear up. How this arises will be apparent from the statement with which Professor HARVEY commences the preface to his third volume: 'This . . . contains the orders of CALYCIFLORÆ with a monopetalous corolla

and an inferior ovary. The fourth volume . . . will, it is hoped, include the Heaths (*Ericeæ*) and all the *Monopetalæ* with superior ovaries, *i.e.*, the COROLLIFLORÆ proper.' BENTHAM and HOOKER in the *Genera Plantarum* have adopted the sub-class GAMOPETALÆ from Endlicher, who had established it in 1836 to include all orders with a monopetalous corolla. This arrangement has been followed in the present work from Volume IV. onwards. The removal of monopetalous orders from *Calyciflorœ* does not, however, affect the sequence in which they are dealt with. But in order to make the classification consistent throughout, it is necessary in the first place to substitute the following new definitions of sub-classes 1–3 for those given by Professor HARVEY in Vol. I., p. xxxiii."

"Sub-class I.—THALAMIFLORÆ. Ord. I.–XLI. (Vol. I., pp. 1–449). *Calyx and Corolla* (generally) present. *Petals* separate, inserted, as are also the *stamens*, on the receptacle (i.e., *hypogynous*). *Ovary* free.

"Sub-class II.—CALYCIFLORÆ. Ord. XLII.–LXX. (Vol. I., pp. 450–528; Vol. II., pp. 1–572). *Calyx and Corolla* (generally) present. *Petals* separate. *Stamens* inserted on the calyx (*perigynous*) or on the ovary (*epigynous*). *Ovary* free or more or less adnate to the calyx-tube. LXXI. *Balanophoreæ* (Vol. II., p. 572), and LXXII. *Loranthaceæ* (Vol. II., p. 574) are transferred to MONOCHLAMYDEÆ.

"Sub-class III.—GAMOPETALÆ. Ord. LXXIII.–CVI. (Vols. III., IV., and V.. sect. 1, pp. 1–392). *Calyx and Corolla* both present. *Petals* united in a gamopetalous corolla. *Stamens* inserted upon the corolla. *Ovary* free or more or less adnate to the calyx-tube.

"In the second place, the 'Sequence of Orders' in Vol. III., p. ix., must be remodelled as below; the definitions of the orders themselves are unaffected.

"Sub-class III.—GAMOPETALÆ. Ord. LXXIII.–LXXVII.
"Series I.—INFERÆ. Ord. LXXIII.–LXXVII. *Ovary* inferior.
"COHORT i.—RUBIALES. *Stamens* epipetalous. Ovary 2–∞-celled, cell 1–∞-ovuled.
"LXXIII. RUBIACEÆ (page 1).
"COHORT ii.—ASTERALES. *Stamen* epipetalous. *Ovary* 1-celled, 1-ovuled.
"LXXIV. VALERIANEA (page 39).
"LXXV. DIPSACEÆ (page 41).
"LXXVI. COMPOSITÆ (page 44).
"COHORT iii.—CAMPANALES. *Stamens* usually epigynous and free from the corolla.
"LXVII. CAMPANULACEÆ (page 530)."

WITCOMBE, *6th May*, 1912.

Makruss or Zimbiti.—This interesting tree, described in this work for the first time in December, 1908 (*K.B.*, 1908, p. 439), as *Androstachys Johnsonii*, was almost simultaneously described and figured by Mr. T. R. Sim (Forest Flora and Forest Resources of Portuguese East Africa, p. 66, t. 61A), in January, 1909. A fuller account of the tree was published in June, 1909 (*K.B.*, 1909,

p. 201), without it being possible to refer to Mr. Sim's account, a copy of which, through the courtesy of the author and his publishers, was presented to the Library at Kew on 12th August, 1909.

More recently we have been indebted to the courtesy of Mr. J. Burtt Davy for the communication of specimens of the same species from the Lebombo Mountains, whence also came those dealt with by Mr. Sim. In describing and figuring the tree, which he was compelled to do without either flowers or fruits, Mr. Sim, depending upon the character of the stipules, placed the species in the natural family *Rhizophoreae*, and referred it doubtfully to the genus *Weihea* as *W.? subpeltata*. By Mr. Burtt Davy it was in the field referred correctly to *Androstachys Johnsonii*, Prain. Mr. Sim had specimens sent from Mozambique in connection with an application by the Railway Department as to its utilisation for sleepers; he collected it himself in dense pure thickets in kloofs on the Lebombo Mountains, where its timber is well known. Mr. Burtt Davy's specimens are also from kloofs of the Eastern Lebombo Mountains, where "the tree is gregarious, forming dense thickets." Mr. Sim states that he was informed by English, Dutch, Kaffir and Swazi alike, "that bees nesting in this tree made poisonous honey." He found the trees always with fine clean straight stems, but was informed that very large specimens are usually hollow. Mr. Burtt Davy speaks of the timber as apparently practically indestructible.

The vernacular names given by Mr. Sim are:—(1) "Umbitzan," in the Tronga language spoken at and near Lourenço Marques; of this name the word "Zimbiti," sent by Mr. W. H. Johnson from Beira, seems a variant. (2) "Mocurusse," in the Swahili language, the name originally communicated by Mr. Consul O'Neill from Mosembe as "Makruss" in 1883; and (3) "Bekungu," in the Swazi language as used on the Lebombo Range. In a letter dated 17th April, 1912, forwarding his Lebombo specimens, Mr. Burtt Davy uses the name "um Koobookooboo"; but in a subsequent letter dated 10th June, 1912, the same correspondent uses the modified form "Ubu-Koonkoo," which more clearly approaches the form from the same general locality employed by Mr. Sim.

Federated Malay States.—An interesting guide to the Federated Malay States, edited by Mr. C. W. Harrison, of the Malay Civil Service, has recently been published by the Malay States Information Agency. The book is well illustrated, both by colour reproductions and photographs, and contains an excellent map.

Among other items the Malay Peninsula from north to south is described, especially in relation to the railway line from Penang to Singapore. There are also useful notes for travellers, containing accounts of the various peoples of the peninsula and their habits, customs, etc., and much practical information on all subjects likely to be needed by the visitor.

Big game shooting occupies another chapter, and there is a very interesting account of the museums at Taiping and Kuala Lumpur, in which the collections are referred to in some detail.

A list of Rest Houses, Tables of Distances, and other useful information concludes the volume, which is supplied with a good index.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 7.] [1912.

XXXVI.—ELEPHANT GRASS.

A New Fodder Plant.

(*Pennisetum purpureum*, Schum.)

O. Stapf.

In the "Rhodesian Agricultural Journal" for June, 1910 (vol. vii., p. 1398), a new fodder grass was described as Zinyamunga or Napier's fodder. It was referred to *Pennisetum*, and compared especially with *P. spicatum* (*P. typhoideum*), the well known pearl millet. Last autumn specimens of the grass were received at Kew, and later a chemical analysis of the stalks and leaves was sent by Mr. H. Godfrey Mundy, Agriculturist and Botanist of the Department of Agriculture, Salisbury, Rhodesia.

The grass was easily identified as *Pennisetum purpureum*, Schum. (*P. Benthamii*, Steud.), a species of very wide range in Tropical Africa; but, common as it is, very little is known about its life history and uses, and even its limits as a species and its differentiation into varieties is not settled. It will therefore be useful to gather in a brief account all that is at present ascertainable about the grass.

Definition of the Species.—A tall perennial grass with a creeping rhizome (*Barter*). *Culms* erect, in tufts of up to twenty, usually 2–3 m., or occasionally up to 7 m. high and 1·2–2·5 cm. thick at the base, branched—particularly upwards—with the branches obliquely erect, terete, glabrous, smooth, excepting the uppermost internode, which is more or less hairy to tomentose in the upper part, the exserted parts sometimes covered with a glaucous bloom; nodes mostly exserted from the sheaths, all glabrous or most of them or only the uppermost with a ring of stiff long adpressed hairs. *Leaf-sheaths* terete, clasping the stem, striate, usually glabrous and smooth or more or less pubescent to hirsute with tubercle-based hairs near the top; *ligule* a narrow rim bearing a

(25633—6a.) Wt. 189—808. 1125. 9/12. D & S.

dense fringe of white hairs up to 2 or 3 mm. long; *blades* linear, not or slightly attenuated at the base and inserted on the sheath with a very marked hinge-fold, very long, tapering upwards to a fine point, 30–60 (rarely to 90) cm. long and up to 2·5 cm. wide, with a strong midrib, rounded on the back with a shallow channel above towards the base, and in the larger leaves with six or seven slightly prominent primary nerves on each side, dull green, sometimes slightly glaucous or faintly tinged with purple, more or less rough on both sides, glaucous beneath, usually more or less hairy above, particularly towards the base which sometimes becomes fringed, hairs fine, mostly rather stiff and long and often springing from small tubercles; margins spinulously scabrid, the spinules sometimes very firm and sharp. *Inflorescence* an erect, dense, cylindric spike, from 8 to 20 and even 30 cm. long and 1·5–3 cm. wide, usually yellow or tinged with brown, purple or quite blackish-purple, made up of deciduous spikelets or fascicles of spikelets, each spikelet or fascicle surrounded by an involucre of numerous bristles of unequal length, most of them 5–8 mm. long, one usually very much longer (1·2–2 or exceptionally to 4 cm. long), scabrid, one or several of the innermost and longest sparingly plumose towards the base, rarely all naked, often dark yellow, brownish or purplish towards the tips or blackish-purple from the base. *Spikelets* sessile or if in fascicles of 2–4, the lateral pedicelled, all lanceolate, more or less acuminate, 5–7 mm. long, glabrous, straw-coloured or tinged with brown or purple towards the tips of the florets, rarely blackish-purple all over, ♀ or, if fascicled, the lateral ♂, rarely neuter or all ♀. *Lower glume* suppressed or quite rudimentary, upper ovate to ovate-lanceolate, acute, 0·5–1 (rarely to 2) mm. long, subhyaline, 1-nerved or nerveless. *Lower floret* ♂ or more often barren; valve lanceolate, acute or acuminate, half as long to almost as long as the upper floret, more or less distinctly 3-nerved, rarely 1- or 5-, or even 7-nerved; palea linear-lanceolate, 2-nerved, shorter than the valve or in the barren florets much reduced or suppressed. *Upper floret* ♀ or in the lateral spikelets ♂; valve lanceolate, acuminate or rostrate-acuminate, very minutely scaberulous upwards, usually 5-nerved, nerves more or less prominent towards the tips; palea narrow, linear-lanceolate, slightly shorter than the valve, tips minutely 2-toothed. *Lodicules* 0. *Anthers* 2·5–3 mm. long, tips very minutely penicillate. *Styles* united all along; stigmas very slender, up to 4 mm. long, exserted from the tip of the floret. *Grain* unknown in the mature state; almost mature obovoid with a large, orbicular hilum and an orbicular-elliptic scutellum.

As will be seen from the description, several of the characters, such as the amount of indumentum, the number of spikelets in each partial inflorescence and their sex, the colour of the bristles of the involucre and the florets and the relative length of the glumes and valves and their nervation, vary within considerable limits. These variations appear to be independent of each other, and also to be unrelated to the geographical distribution. The most that can be said from the material at hand is that, on the whole, the nodes are usually bearded in specimens from the north-western and northern parts of the area, and usually glabrous in those from the south and

south-east. But perfectly glabrous nodes—glabrous from the beginning—may be found along with bearded ones in the same plant, when it is generally the lower nodes which are glabrous. The hairs which form the beard of the nodes spring mostly from the top of the internode and cover the annular sheath-joint, which itself is glabrous. Their distribution around the joint is frequently unequal, and on the older nodes they finally rub off. The waxy bloom so distinct in some samples is mostly confined to the upper parts of the internodes, but may also be seen on the backs of the blades and sheaths although it is much fainter there. This character too is apparently unconnected with others and does not coincide with definite divisions of the area. The purple or bronzy colouring of the inflorescence is just as erratic; but really dark spikes, blackish-purple all over, are rare. When the partial inflorescences are unispiculate, the spikelets are always bisexual with or without a male flower in the barren floret; but where there are two or more spikelets in a fascicle, the tendency is towards a reduction of the sexual organs in the outer spikelets, so that their upper floret becomes male and the lower neuter or, in extreme cases, both are neuter. This reduction may or may not be accompanied by a slight increase in length and nervation of the valve of the lower floret and sometimes also of the upper glume. Those fluctuations are generally found within the same inflorescence, the lower partial inflorescences being frequently 2–4-spiculate, whilst the upper are 1-spiculate, or they may only become evident by comparing different specimens from the same gathering. They are probably due to varying conditions of nutrition either within or without the plant, or may be due to sporting tendencies, in which case they might be expected to run through many generations and constitute more or less constant races. To sporting or mutation I would also trace the apparently erratic variation in the length of the bristles of the involucre, and especially of the longest, and in the degree to which the inner bristles are plumose, a character which is never very marked in this species and may even completely fail.

Considering the instability of all these characters it is clear that the discrimination of subordinate groups other than sports or mutations within *P. purpureum* in so far as it is based on them must result in the production of artificial divisions and can serve no useful purpose. I refrain therefore from subdividing the species or taking up Hackel's varieties *sambesiense*, *nudum* and *ternatum*,* and even doubt whether Leeke's species *P. flavicomum*, *P. pruinosum* and *P. pallescens*† can be maintained, as all the distinctive characters which he adduces seem to come within the limits of fluctuation just described. Unfortunately Leeke omitted to quote the specimens on which he bases his species, nor does he give any indication of their habitats except in the most general terms, as East Africa or Togo; but so far as they go, the species cited occur entirely within the area of *P. purpureum*.

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* In Schinz, Plantae Menyharthyanae in Denkschr. Ak. Wiss. Wien, vol. lxxviii, p. 400.

† Leeke, Abstamm. u. Heimat. d. Negerhirse, pp. 45–47.

As to the name *P. purpureum*, this was given by Schumacher to a plant collected by Thonning on the Gold Coast in the latter part of the 18th century. A specimen from the same collector and answering exactly Thonning's description came from Vahl's herbarium through Nolte to the British Museum, and it may be taken to constitute a cotype. Rendle* has already pointed out that it is identical with Bentham's *P. macrostachyum*,† which, owing to there being already a *P. macrostachyum* by Brongniart, was renamed *P. Benthamii* by Steudel,‡ a name until recently very commonly used for the grass which is the subject of this article. In fact, Bentham himself was quite aware of the probability of the identity of his and Schumacher's species, but was misled into describing the grass he had before him on account of the absence of the purple colouring insisted upon by Schumacher. We now know that no importance attaches to this as a taxonomic character. As to the other synonyms to be referred to *P. purpureum*, one, *P. nitens*, Hack.§ rests on *Gymnothrix nitens*, Anderss.,‖ and represents a robust yellow-spiked state, common in South East Africa, whilst the other *P. flexispica*,¶ K. Sch., was based on East African specimens which happened to have a more slender and therefore more flexible rhachis.

Distribution. The area of *P. purpureum* lies between 10° N. Lat. and 20° S. Lat. The northern limit runs from Sierra Leone through the great equatorial forest belt to the Cameroons and the basin of the Ubangi, then to the Nile (at 3° N. Lat.), Lake Victoria and German East Africa, where it reaches the coast in about 5° S. Lat. In the south the area is bounded by a line extending from Loanda in about 9° S. Lat. through Angola to Katanga and then across the Middle Zambesi to Eastern Rhodesia, whence in about 20° S. Lat. it strikes eastwards as far as Beira. Within this immense area it occurs mainly along watercourses and in marshy depressions, but also enters the bush and forest where open spaces afford sufficient light. Under favourable conditions it forms extensive reed jungles, as for instance in the delta of the Zambesi and along the Shire. Even in forests it is locally "only too common," as Welwitsch puts it. In the interior of Sierra Leone it ascends nearly to 900 m., and near its southern limit in the Melsetter district of Rhodesia to 1800 m., whilst in the Cameroons it is said to reach even the upper limit of woods. It is in rich marshland where it attains to a height of 7 m. and even more, whilst on drier soil, as in the savannas of East Africa, its culms are hardly more than 2 m. high. It also appears occasionally on abandoned cultivated land and has, in a few cases, been observed in a state of cultivation.**

Vernacular names. It is not surprising that a grass of so wide a distribution and striking appearance should have special names in

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* In Welwitsch, Cat. Afr. Pl. vol. ii, p. 190.
† In Hooker's, Nig. Fl. p. 563.
‡ Steudel, Syn. Pl. Glum. vol. i, p. 105.
§ In Bolet. Soc. Brot. vi (1888), p. 142.
‖ In Peters, Reise nach Mossamb. vol. vi (1864), p. 552.
¶ K. Schumann in Engl., Pflanzenw. Ost Afrne. C. (1895) 105.
** Kaiser, Acc. to Just's Jahresber. 1898, vol. i, p. 561.

many of the native dialects of Africa. The following is a list, compiled from publications and collectors' notes :—

Togo : Adá ; 'Elephanten grass' of German colonists.

Southern Nigeria: Esun funfun (Dodd) ; Esun (Millen) ; Esu pupu (MacGregor).

Belgian Congo. Lower Congo : Madiadi (Laurent) ; Ubanzi District, Mokango : Songo Songo (Bouckenaert) ; Yakoma : Awors (quoted by De Wildeman). Bangala District, Nouvelle Anvers : Sosongo, Libwakanike (De Giorgi). Territory of Rusisi Kivu : Matete (quoted by De Wildeman) ; Baraka : Mabingobingo (Dohet). Katanga : Dilenge (Verdick).

Angola : Mariango, Marianga, Marianko (Welwitsch, Buchner, Pogge), Massango (Welwitsch), Malenge-lenge, Malanga (quoted by Leeke).

Uganda, Madi : Maweengo-weengo (Grant).

Usambara : Mbuhu, Nguhu (Holst).

Rhodesia, Gutu : Zinyamunga (Kenny), marabagunda,* dumba-munga (Napier), miraba munga (Mundy).

Uses. Of the stems of the grass Grant† reports :—"The tall fences surrounding the residences of the Waganda King and people are of this useful reed ; the interiors of all Waganda houses are walled into compartments by it. A strip from it is so sharp that it is used for cutting up meat, and also cutting into fragments the victims of the King of Uganda."

The first mention of *P. purpureum* as a fodder grass is in Schinz, Plantae Menyharthianae‡ (1905), where the grass is stated to be good fodder for cattle. The note refers to an observation by Menyharth, a Hungarian missionary who from 1889 or 1890 to about 1894 collected in the neighbourhood of Boruma, not far from the Zambesi in the Eastern part of North-west Rhodesia. A remark to the same effect, "Species bovibus nutrimentum maxime idoneum," by Leeke§ (1907) rests on the authority of Herr Deistel, Government Gardener in the Cameroons, and Pilger in Engler, Pflanzenwelt Afrika‖ (1908) describes it as one of the best fodder grasses.

Independently of those sources, Mr. E. G. Kenny, Native Commissioner, Gutu, and Col. Napier, of Springs, Bulawayo, called the attention of the Agricultural Department of Rhodesia to the value of the grass as a fodder plant.¶ They first noticed it about 1908, "growing in the Gutu district in native lands and being used, as the natives explained, as a muti, or mushonga, to make the other crops grow." It was not growing wild there, and its origin was stated to be doubtful, but Mr. Swynnerton** states that

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* M'ramba munga in the report, reproduced on p. 315.
† Quoted by Oliver in Bot. Speke & Grant Exped. in Trans. Linn. Soc., vol. xxix, p. 172.
‡ In Denkschr. Ak. Wiss. Wien, vol. lxxviii, p. 400.
§ Leeke, Abstamm. u. Heimat. d. Negerhirse, p. 48.
‖ In Engler, Pflanzenwelt Africas, vol. ii, p. 145.
¶ Rhodes. Agric Journ. vol. vii, p. 1398.
** See Rendle in Journ. Linn. Soc. vol. xl, p. 231.

it grows in the Melsetter district, about 80 miles south-west of Gutu. Col. Napier has experimented with it, and a short account of his experiences, including a chemical analysis of the grass by the Chemist of the Rhodesian Agricultural Department, was published in the Rhodesian Agricultural Journal for 1909–1910, from which the following paragraphs are taken :—

(p. 1398.) "Like Pearl Millet it is reported to be an extremely good drought resister. (p. 1399.) Col. Napier and Mr. Kenny both state that it remains green on dry land late into the autumn and withstands frost to a remarkable degree. Col. Napier has tested it under most severe conditions and is firmly convinced of its economic value. He has now several acres planted on vlei ground on the Central Estates, and is hopeful that in spite of frost it will afford green feed late into the winter. Both cattle and horses eat it readily.*

"Like sugar cane the plant may be propagated either by subdivision of the roots or from cuttings or slips. It roots freely and is reported to grow rapidly after each cutting, thereby enhancing its value as a soiling crop. It seems probable therefore that in Napier's fodder we have found a hardy perennial plant of considerable value for winter feed and suitable for planting on light dry soil.

"**Chemical Analysis.**—The Agricultural Chemist of this Department has made the following analysis of a mature stalk of Napier's fodder which arrived at the laboratories in a partially dried condition, showing that it is comparable in feeding value to maize stalk roughage :—

	Per cent.
Water	55·33
Ether extract	0·84
Protein	3·10
(Total nitrogen converted to equivalent in protein.)	
Carbohydrates	21·16
Fibre	15·66
Ash	3·71
	100·00
Ether extract with chlorophyll removed therefrom ...	0·57
True protein	2·11

Since then another analysis was made from material grown on the Botanical Experiment Station,† Salisbury ; and this together with an analysis of sugar cane from the same station is reproduced below, with the permission of the Agricultural Department, Salisbury, Rhodesia.

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* Col. Napier has formed so high an opinion of this crop that it is certainly worth a trial in other parts of Southern Rhodesia, and through his co-operation this Department is able to offer a limited number of roots f o.r. Gwelo, under the usual terms of co-operative experiments.

† Communicated to Kew in December, 1911.

"Composition of *Sugar Cane Fodder* (Saccharum officinarum) and *Zinvamunga Fodder* (M'ramba munga or Napier's fodder Setaria sp. or Pennisetum sp.?) grown on the Botanical Experiment Station, Salisbury.

Particulars of Planting, &c.

—	Sample for Analysis.			
	Time Planted.	Collected.	Length of Stalk in Feet.	Length of Leaf in Feet.
Sugar cane	Jan., 1910 ...	July, 1911...	2	4
Zinyamunga	March, 1910 ...	,, ,,	8	2

The fodder had not been cut since planting.

Analysis.

—	Sugar Cane Fodder.	Zinyamunga Fodder.
	Per cent.	Per cent.
Water	73·63	61·81
Ether extract	0·22	0·29
Protein (Nitrogen X 6·25)	1·27	2·92
Carbohydrates	17·73	17·29
Woody fibre	5·32	14·77
Ash	1·83	2·92

"The amount of juice expressed from stripped stalks by passage between the steel rollers of an ordinary flattening mill used for rolling out metals was in each case as follows :—

—	Sugar Cane Stalks.	Zinyamunga Stalks.
	Per cent.	Per cent.
Juice expressed	56·6	21·3

"The juice of Zinyamunga was tasteless and of low sugar content, whilst that of sugar cane was sweet and contained 6·69 per cent. Sucrose (cane sugar) and 2·84 per cent. Glucose."

No analyses of the ash were made at Salisbury, but this gap is fortunately supplemented by Dr. F. Zeller,* of Victoria, Cameroons, who considers the rotting grass as well as its ash a very valuable manure ; and this may actually be the meaning of the statement of

* Tropenpfl., vol. xv. (1911), p. 357.

the Gutu natives that they plant it "to make the other crops grow." According to him 100 kilogr. of dried grass with a water content of 10 per cent. contain—

1·3	kilogr.	N	corresponding to	6·5	kilogr.	sulphate of ammonia.
2·02	,,	K_2O	,, ,,	4·0	,,	chloride of potassium.
0·38	,,	P_2O_5	,, ,,	1·9	,,	superphosphate.
0·07	,,	C_aO				
0·1	,,	M_gO				

The best method of propagating the grass is probably by dividing the clumps or from cuttings. No mature seeds have come to hand so far. Searching the ample material of *P. purpureum* at Kew I came across one grain only, and this was not quite mature. Whether this means that the grass actually seeds rarely, or whether it may be that the grains escaped the collectors owing to the extreme readiness with which the spikelets with their involucres detach themselves, I am unable to say.

XXXVII.—ACCESSION OF TROPICAL AFRICAN PLANTS FROM 1907–1912.

The following list of Tropical African collections of Phanerogams and Vascular Cryptogams received at the Herbarium during the last 5½ years (from January 1st, 1907, to July 1st, 1912), has been drawn up by the Assistant for Africa.

The total number of specimens in these collections, excluding duplicates, is 22,286, of which 16,434 were presented and 5852 purchased. This is an increase of 7659 compared with the number received during the previous seven years (cf. *K.B.* 1907, p. 237). About 18,000 were received for determination, and each collection, except in a few cases, was dealt with on arrival. More than three-fourths of the specimens received have been named and mounted and have been incorporated or are ready for incorporation in the general herbarium.

Comparatively little has been published on these collections. Those specimens which belong to the families published in the parts of the Flora of Tropical Africa issued during the same period have as usual been recorded in that work. Many new species which have been worked out have been described in various numbers of the *Kew Bulletin*, and the following papers have been published in the same work:—Trees of the North-eastern Transvaal, by C. E. Legat (*K.B.* 1910, pp. 49–55); Notes on the Botanical Resources of Yola Province, Northern Nigeria, by Dr. J. M. Dalziel (*K.B.* 1910, pp. 133–142). The latter paper contains descriptions of three new species.

Allen, C. E. F.: Rhodesia, 242 specimens (unnamed), partly collected with **Dr. E. A. Nobbs.**

Anderson, J.: Gold Coast, 58 specimens (unnamed).

Appleton, Lt.-Col. A. F.: Rhodesia and Portuguese East Africa, 65 specimens, mostly *Gramineae* and *Cyperaceae* (unnamed).

Barraud, Miss: British East Africa and Pemba Island, 30 specimens (unnamed).

Battiscombe, E.: British East Africa; Tana River and other localities, 304 specimens (unnamed); some communicated by Mr. D. E. Hutchins.

Bolus, Mrs. F., see KOLBE.

Brand, E.: British East Africa, 17 specimens (unnamed).

Brent, R. W.: Gold Coast, 12 specimens (unnamed).

Broun, A. F., and Mrs.: Eastern Sudan, 468 specimens (partly named).

Brown, E.: Uganda, 27 specimens (unnamed).

Burtt-Davy, J.: see LEGAT.

Chevalier, Dr. A.: Upper Guinea (chiefly French territory) and French Congo, about 1600 specimens (partly named).

Chipp, T. F.: Gold Coast, 130 specimens (unnamed).

Cockburn, N. C.: British East Africa (mostly), about 70 specimens (unnamed).

Colville, Mrs. O.: Nyasaland and North-east Rhodesia, 16 specimens and water-colour drawings (unnamed); British East Africa; Aberdare Mts., 20 specimens (unnamed).

Cordeaux, Capt. H. E. S., C.M.G.: Somaliland, 1 specimen of *Cordeauxia*.

Craster, Mrs. W.: Rhodesia; Salisbury, 80 *Gramineae* (unnamed).

Dalziel, Dr. J. M.: Northern Nigeria, various provinces, 1017 specimens (unnamed); transmitted by the Government of Northern Nigeria through the Imperial Institute.

Davy, E. W.: Nyasaland, specimens and seeds of *Widdringtonia*; communicated by the Editor of the Gardeners' Chronicle.

Dawe, M. T.: Uganda, 100 specimens (unnamed); Portuguese East Africa and South-east Rhodesia, 222 specimens (unnamed).

Dennett, R. E.: Lagos, 24 specimens (unnamed); Southern Nigeria, 50 specimens (unnamed).

De Wildeman, Dr. E.: fragments of *Loranthaceae*, etc.; see also SAPIN.

Dodd, H.: Lagos, 31 specimens (unnamed); communicated by N. C. McLeod, Assistant Conservator of Forests, S. Nigeria.

Drake-Brockman, Dr. R. E.: British Somaliland, 492 specimens (unnamed); Southern Abyssinia, 276 specimens (unnamed); communicated by the Colonial Office.

Dudgeon, G. C.: Gold Coast, 21 specimens; Northern Nigeria, 20 specimens; Southern Nigeria, 6 specimens (unnamed); communicated by Prof. W. R. Dunstan on behalf of the Imperial Institute.

Elliott, C. F.: British East Africa, 2 specimens (unnamed).

Elliott, W. R.: Northern Nigeria, 79 specimens (unnamed).

Engler, Prof. A., numerous duplicates of plants belonging to various orders.

Evans, A. E.: Gold Coast, 25 specimens (unnamed).

Evans, M. S.: British East Africa and Uganda, 44 specimens (unnamed).

Farquhar, J. H. J.: Southern Nigeria, 59 specimens (unnamed).

Foster, E. W.: Lagos and Southern Nigeria, 255 specimens (unnamed).

Fyffe, R.: Uganda, 274 specimens (unnamed).

Gairdner, Miss A. E.: North-west Rhodesia; Shesheke District, abont 300 specimens (partly determined at Kew by Miss Gairdner).

Galpin, E. E.: British East Africa, 29 specimens (unnamed).

Gibbs, Miss L. S.: Southern Rhodesia, 32 specimens (named).

Gilg, Dr. E.: see TESSMAN, ZENKER.

Gossweiler, J.: Angola, 2644 specimens (unnamed).

Heller, E.: British East Africa, 76 specimens (unnamed), collected on the Roosevelt Expedition to East Africa; communicated by G. S. Miller on behalf of the Smithsonian Institute.

Houard, Dr. C.: Sudan, 18 specimens of gall-bearing plants (unnamed); returned to collector after determination.

Howells, W.: Uganda, 2 specimens (unnamed).

Hutchins, D. E.: British East Africa, 87 specimens (unnamed); see also BATTISCOMBE.

Johnson, W. H.: Portuguese East Africa and Eastern Rhodesia, 285 specimens (unnamed).

Johnston, Sir H. H.: Liberia, 16 specimens and some dried fruits (unnamed).

Kässner, T.: Belgian Congo and East Africa, 442 specimens (mostly unnamed), purchased.

Kolbe, Rev. F. C.: Rhodesia, 22 specimens (unnamed); communicated by Mrs. F. Bolus.

Lamborn, Dr.: Near Lagos, 36 specimens (unnamed); communicated by Prof. E. B. Poulton.

Lane-Poole, C. E.: Sierra Leone, 114 specimens (unnamed).

Last, J. T.: Zanzibar Island, 363 specimens (unnamed).

Legat, C. E.: Northern Transvaal; Zoutpansberg, 74 specimens (unnamed), with 5 photographs, 2 maps and collector's notes; communicated by Mr. J. Burtt-Davy.

Lugard, Col. E. J.: Northern Nigeria, 22 specimens (unnamed).

Macaulay, Mrs.: Northern Rhodesia; near Mumbwa, 390 specimens (unnamed).

Maitland, T. D.: Southern Nigeria; Old Calabar, 14 specimens (unnamed).

McLeod, N. C.: see DODD.

Miles, A. C.: Ashanti, 16 specimens (unnamed).

Miller, G. S.: see HELLER.

Mundy, G.: Rhodesia, 1 specimen of *Schrebera mazoensis*.

Newland, Capt. A. E.: British East Africa; Mt. Elgon, 6 specimens (unnamed).

Nobbs, Dr. E. A.: see ALLEN.

Northey, Miss M.: British East Africa, book of coloured drawings of plants for determination; returned to Miss Northey.

Parsons, Dr. A. C.: mostly Northern Nigeria, 201 specimens (unnamed), and a few water colour drawings.

Pearson, Prof. H. H. W.: South Angola and Great Namaqualand, 912 specimens (unnamed); collected on the Percy Sladen Memorial Expedition in South-west Africa, 1908–1909.

Poulton, Prof. E. B.: see LAMBORN.

Powell, H.: British East Africa, 178 specimens (unnamed).

Purves, J, M.: Nyasaland, 36 specimens (unnamed).

Rogers, Rev. F. A.: Rhodesia and a few from Belgian Congo, 2143 specimens (unnamed), purchased; partly communicated by Dr. S. Schönland.

Routledge, W. S.: British East Africa, 229 specimens (unnamed).

Rudatis, H.: Cameroons, 58 specimens (unnamed); communicated by Dr. H. Schinz.

Sapin, A.: Belgian Congo, 33 specimens (named); communicated by Dr. E. De Wildeman.

Scheffler, G.: British East Africa, 299 specimens (mostly named), purchased.

Schlechter, Dr. R.: Upper Guinea, 373 specimens (named), purchased.

Schinz, Dr. H.: Somaliland, 2 grasses; see also RUDATIS.

Schönland, Dr. S.: see ROGERS.

Shaw, B. B.: Northern Nigeria, 109 specimens (unnamed).

Smythe, C. W.: Sierra Leone, 202 specimens (partly named); partly communicated by the Colonial Office; see also UNWIN.

Stocks, J.: Portuguese East Africa, about 250 specimens (unnamed).

Stordy, R. J.: Southern Abyssinia, 27 specimens, mostly grasses (unnamed).

Swynnerton, C. F. M.: Portuguese East Africa (Gazaland) and South-east Rhodesia, 882 specimens (named), purchased.

Talbot, P. A. and Mrs.: mostly Southern Nigeria, 1024 specimens (unnamed); 520 specimens (named), communicated through Dr. A. B. Rendle.

Tessmann, G.: Spanish Guinea, 713 specimens (unnamed), purchased; received through the agency of Dr. E. Gilg.

Thomas, N. W.: Southern Nigeria, about 1400 specimens (unnamed).

Thompson, H. N.: Southern Nigeria, 16 specimens; Gold Coast, 81 specimens (unnamed).

Thonner, F.: Belgian Congo, 35 specimens (named).

Tremearne, Capt. A. J. N.: Northern Nigeria, 30 specimens (unnamed).

Unwin, A. H.: Southern Nigeria, 144 specimens; Sierra Leone (collected with **C. W. Smythe**), 38 specimens (unnamed).

Ussher, C. B.: Uganda; Mabira Forest, 100 specimens (unnamed).

Wellman, Dr. F. G.: Angola, 63 specimens (unnamed).

Williams, J. L.: Southern Nigeria; Calabar, 56 specimens (unnamed).

Yates, C. C.: Northern Nigeria, 76 specimens (unnamed).

Zenker, G.: Cameroons, 1000 specimens (mostly named), purchased; received through the agency of Dr. E. Gilg.

XXXVIII.—VISIT OF THE ROYAL SCOTTISH ARBORICULTURAL SOCIETY TO DEESIDE.

W. Dallimore.

By permission of the Director I was enabled to take part in the annual excursion of the Royal Scottish Arboricultural Society which took place this year on Deeside and lasted from June 24th to June 29th. The estates visited included Balmoral, Ballogie, Finzean, Crathes and Durris.

Leaving Aberdeen in motor cars on the afternoon of June 24th, the valley of the Dee was traversed to Braemar, thus enabling members to form a general idea of the wide extent of forest existing throughout the region, for from the time Aberdeen is left until Braemar, 60 miles distant, is reached, a great deal of land on either side of the valley is well wooded. Much importance is attached to this region, for it contains some of the best timber grown in the British Isles. There is a considerable amount of land worth planting; the railway runs for 40 miles along the valley and there is a good outlet for timber in Aberdeen.

The planted area contains woods of all ages, from those newly planted, to others which have passed into the hands of the timber merchant, and a large percentage appears to be well managed. The heaviest stands of timber exist between Banchory and Dinnet, but above Ballater there is also a large amount of good timber.

Natural disadvantages to successful forestry, such as wet ground and scarcity of soil, occur on some estates and the usual injuries due to game and vermin are noticeable. With regard to the latter the fact cannot be too strongly emphasised that the best results from forestry operations can only be expected after the exclusion of deer, hares and black game from young plantations, and with the wholesale destruction of rabbits and squirrels. Moreover, if woods are to be replenished by natural regeneration, deer must not be admitted even when the trees are mature. A visit to Ballochbuie forest illustrates this, for where the forest is open to deer scarcely a young tree is to be seen, but in fenced areas a dense crop of vigorous young trees covers the ground.

The results of various methods of thinning adopted on different estates are very noticeable, the mature crops in some places being much denser than in others whilst there is little to choose between the cubical contents of average trees. There is no doubt that one all-round system of thinning would be impracticable as conditions vary so widely in even a small area, yet one has to admit that less thinning in many cases would be advisable.

Fewer new plantations are being formed than one would have expected, considering the quantity of waste ground available and the fact of the region having proved itself to be peculiarly adapted for the growth of trees. Though difficult to form anything like an accurate opinion from a hurried visit, it would appear that no greater area of land is being planted than that which is being cleared.

Here and there plantations are noticed in unsuitable places such as on very high and exposed land, and in such cases the trees are usually poor and stunted. At present there is plenty of land lying idle at fairly low elevations and moderately well sheltered. Until such land is planted up there appears, therefore, to be little reason for undertaking the hazardous experiment of planting the less favourable positions.

Taking the woods visited as a fair sample of those existing throughout Deeside, however, they impress one favourably, and were the woods in every district of the country in as good order, forestry in the British Isles would be in a flourishing condition.

The large area of woodland has made the district one of the principal training centres in the country for young foresters, and many of the leading foresters of the day have received a portion of their training on one or other of the estates. A difficulty has, however, been found in the past by young foresters, in obtaining experience in anything except practical work. To meet this want the authorities of Aberdeen University and the North of Scotland College of Agriculture have instituted courses of lectures on the theoretical and scientific sides of forestry for men who have had practical training.

A course of instruction which has proved to be very popular extends from October to March. This is purely academical and includes lectures, laboratory work and occasional excursions to woods in the vicinity for demonstration purposes.

Last winter 24 students, 11 of whom were young foresters in the North of Scotland, attended the course, the ages of the men beiug between 18 and 22. The fees for the course amount to three guineas and the cost of board and lodging to each student is about 15 shillings a week. The expense is sometimes borne by the student and sometimes by his employer, or the cost may be divided. There is also an opportunity for men to obtain County Council Bursaries valued at from £10 to £15 each.

A four weeks' course of instruction for foresters who cannot leave their employment for a longer period has also been arranged. No fee is charged for this course and students are given the free use of microscopes and any other instruments they may require. Men of all ages between 17 and 60 enter as students, and in many cases their out-of-pocket expenses are paid by their employers.

As in the other course, daily lectures are given by Mr. Dawson, the principal forestry official, and all laboratory and demonstration work is supervised by him or by his assistants.

Situated as Aberdeen is, close to one of the best wooded areas in the country, the university and college officials are peculiarly well placed for dealing with the scientific training of practical foresters, for it is but a short journey from the lecture room to the forest; in fact a tram ride of a few minutes, in any one of three directions, is all that is necessary, whilst a journey of half an hour by train opens up a still wider area. In addition to these facilities an experimental plot is about to be established by the Agricultural College and the University.

On Tuesday and Wednesday, June 25th and 26th, the King's woods on the Balmoral Estate were visited. These cover an area of 10,000 acres or about one fourth of the estate. The principal points inspected were Ballochbuie Forest, Garmaddie Wood, Invergelder and Craiggowan, Balmoral Grounds and Abergeldie.

Ballochbuie Forest is one of the few remaining old natural forests of Scotland, and it is to be preserved as far as possible in its primitive condition. Mr. Michie, the King's Factor, gives the age of the older trees as nearly 300 years, but the greater number are much younger. A link with the past was pointed out by the presence of a large dead pine, computed to be 400 years old, with its trunk badly hacked about. This is said to have been done by highlandmen a couple of centuries or so ago, who were in the habit of cutting pieces of resinous wood from both living and dead trees to use for lighting their houses.

The forest occupies fairly steep hillsides and valleys between the elevations of 1000 and 1800 feet and is composed exclusively of Scots pine. The trees average from 70 to 80 feet in height below the 1500 feet level. At 1250 feet the largest tree seen girthed 11 feet 10 inches at 5 feet above the ground and 14 feet at the ground level; there are not many trees, however, which approach this size, and six consecutive trees girthed 4 feet 5 inches; 3 feet 5 inches; 5 feet 3 inches; 3 feet 7 inches; 2 feet 4 inches; and 3 feet 5 inches respectively. These trees are probably from 100 to 150 years old. From 1250 to 1500 feet elevation the trees gradually dwindle in both height and girth measurements, and above the higher altitude they fail to reach a commercial size, until at 1800 feet they are mere bushes scarcely larger than the junipers among which they grow.

Throughout the greater part of the forest there is a marked absence of young trees; a few up to two years of age were noticed, but nothing older. This is accounted for by the presence of deer, for on areas which have been fenced natural regeneration is taking place.

The stand of timber is not very heavy over a considerable portion of the forest, the trees having been over-thinned in the past. The quality of the wood is, however, good; and, considering altitude and poor soil, the general crop may be said to compare favourably with many Scots pine woods which are growing under better conditions.

Much of the soil is light and gravelly, overlying granite. In exposed places there is but a thin layer, but a fair depth occurs in sheltered places between rocks.

Over the greater part of the forest there is a considerable undergrowth of *Juniperus communis*, *Genista anglica*, *Calluna vulgaris*, *Erica cinerea*, *E. Tetralix*, *Vaccinium Myrtillus*, *V. Vitis-idaea*, *Empetrum nigrum*, *Lomaria Spicant*, and various orchids, of which *Orchis maculata* and *Habenaria odoratissima* were most plentiful. Near the summit of Craig Daiyn, 1780 feet, *Arctostaphylos Uva-ursi* occurs among dwarf pines, junipers, and heather, and about the higher points *Listera cordata* was found beneath the heather.

From the summit of Craig Daiyn a glorious view of the forest and hills and valleys of the surrounding country is obtained, and on an exposed point a cairn has been erected, which contains a stone bearing the following inscription: "Queen Victoria entered into possession of the Ballochbuie, 15th May, 1876. 'The bonniest plaid in Scotland.'" The last sentence is said to have reference to a local tradition that Ballochbuie Forest was at one time sold by a McGregor to a Farquharson of Invercauld for a tartan plaid.

Garmaddie Wood.—The trees in this wood number about 250 to the acre, and average about 15 cubic feet of timber each. Other Scots pine woods contain larger trees, and there are larch woods of good quality on the estate. With regard to larch, Mr. Michie is of the opinion that more satisfactory crops of timber can be raised from Tyrolese seed than from seed ripened in Scotland. Japanese larch is not grown.

A plantation of Douglas fir planted in 1886 at an elevation of 1020 to over 1100 feet has made good progress. The taller trees are 45 to 50 feet high. In the vicinity of this wood a group of trees of *Pinus Cembra* planted 24 years ago ranged from 20 to 25 feet in height, *P. monticola* growing near by being about 5 feet higher.

At present all the timber cut is used for estate purposes.

The gardens contain numerous well-developed conifers, which were planted about the year 1860. Some of the best are *Pseudotsuga Douglasii*, 70 feet high by 7 feet 4 inches in girth; *Abies Lowiana*, 45 to 50 feet high; *A. magnifica*, 50 feet by 4 feet 5 inches; and *A. grandis*, 60 feet by 5 feet 9 inches. All the girths were taken at 5 feet above the ground.

A number of good silver firs are to be seen at Abergeldie; the best one girths 12 feet at 5 feet high. They are growing at an elevation of 800 to 900 feet, and natural regeneration takes place.

The Invercauld woods and gardens belonging to Mr. Farquharson were also visited. Perhaps the most interesting tree noted was a horse-chestnut growing at an elevation of 1100 feet. Its height was 40 to 45 feet, and it had a large and shapely head. Near to this tree a large ash, 50 feet high with a girth of 11 feet 11 inches, was seen. A plantation of *Picea alba*, the trees 15 to 20 feet high, and numerous good specimen conifers were noticed. The destructive habits of black game were very noticeable in a plantation of young larch, almost every tree having lost its leader through the ravages of these birds.

On Thursday, June 27th, Ballogie and Finzean estates were visited. These are situated in Kincardineshire, about 10 to 15 miles west of Banchory, in what is said to be one of the heaviest timbered districts in Scotland.

Ballogie, the property of Mr. W. E. Nicol, includes about 3000 acres of forest, which is in all stages of development from newly made plantations to woods ready for cutting. One section is now being clear-cut, and two sawmills are at work converting the timber into posts, rails, boards for building purposes, staves for fish barrels, &c. For the latter purpose there is a good demand in Aberdeen and the neighbourhood. The Scots pine occupy the major portion of the woods, but there is also a good deal of larch.

The custom prevails on this estate of leaving woods unthinned until the thinnings are of scaffold pole size, which may be 30 years from the time of planting. A wood of Scots pine extending over 200 acres, which had been planted about 27 years, now numbers about 2500 trees to the acre, and although no systematic thinning has been done, the number of suppressed trees is not very considerable, although in the past small ones have died and fallen. So far as can be seen, the trees generally are making satisfactory height and girth growth. The ground had previously carried Scots pine and larch. This had been cut in blocks of 50 acres. When replanted, trouble was caused by pine weevils, but this was overcome to some extent in the later plantings by thoroughly loosening the surface soil before replanting. The cost of planting was about £2 15*s.* an acre. An older wood composed of pine and larch carries 200 trees to the acre, the cubical contents averaging about 4000 feet. The trees are about 90 years old. In this wood the little ground orchid *Goodyera repens* was plentiful.

In the gardens surrounding Ballogie House numbers of very fine Scots pine and larch were seen. Of the former species, the largest example measured 108 feet in height and 11 feet 8 inches in girth at 5 feet from the ground. It is 200 years old, and contains about 200 cubic feet of timber. Numerous larch contain 60 feet and upwards. Amongst specimen conifers the following were notable :— *Abies nobilis*, 77 feet high, girth 6 feet 11 inches ; *A. Nordmanniana*, height 79 feet, girth 9 feet ; *A. Lowiana*, 74 feet by 5 feet 10 inches ; *Pseudotsuga Douglasii*, 107 feet by 9 feet 5 inches ; another of the same species, 97 feet by 10 feet ; *Picea sitchensis*, 86 feet by 11 feet 9 inches ; *Libocedrus decurrens*, 30 feet. In another part of the estate, Ballnacraig, two walnut trees, each about 55 feet high, girth 9 feet 1 inch and 9 feet 6 inches respectively, the former at 5 feet, the latter at 3 feet above the ground. These are growing at an elevation of 600 feet and ripen fruits occasionally. An ash tree near by girths 15 feet 8 inches and measures 16 feet to the first branch.

Finzean.—Dr. Farquharson's woods at Finzean contain probably the heaviest stands of timber seen during the tour. A wood of natural-grown larch 200 acres in extent, known as Easter Clune Plantation, contains a fine lot of trees about 40 years old. About the lower parts the cubical contents are about 1800 feet to the acre, the crop being somewhat lighter about the higher points.

Approaching Finzean House the road is bordered on either side by plantations of Scots pine. The trees are remarkable alike for height, clean trunks and girth. They are said to average 250 trees to the acre, and the cubical contents are said to be upwards of 8000 feet to the acre. There was, however, no opportunity of checking these figures. The trees are known locally as "Dr. Farquharson's Walking-sticks." In a mixed wood behind the house a number of very fine larch measuring up to 100 feet in height and 8 feet in girth was noted. Several well-grown specimens of *Tsuga Mertensiana* and *Juglans regia* were also seen.

On Friday, June 28th, a visit was paid to the sawmills of Messrs. A. and G. Paterson, of Banchory, where large quantities of wood from the forests are dealt with. The two great woods of the district, pine and larch, were most in evidence, but Douglas fir and other kinds were also seen. The manner in which timber is injured by squirrels was very noticeable in some of the timber which had been cut up. In some cases the damage is so serious that large sections of trees have to be discarded. Messrs. Paterson have very kindly presented planks of Douglas fir, larch, *Abies nobilis*, &c., for the Forestry Museum at Kew.

Crathes, the estate of Sir Thomas Burnett, Bart., was also visited. Woods of a similar character to those already seen were passed through, and numerous specimen trees in the gardens examined. The fine hedges of yew are one of the principal features of the gardens. These are upwards of 12 feet high and from 8 to 12 feet through. They were planted when the castle was built in 1596, and are in excellent health.

Durris.—A visit to Durris, the Kincardineshire estate of Mr. H. J. Baird, completed the programme. Here a greater variety of trees were found under forest conditions than on the other estates visited. Douglas fir and Sitka spruce planted upwards of 30 years ago look very healthy and are making satisfactory progress. Two plantations of Sitka spruce (*Picea sitchensis*), growing at elevations of 700 and 900 feet respectively, were visited. The trees are 34 years old and are planted on bog land. At the time of planting, drains were opened eight or nine yards apart which still carry off a considerable amount of water. The first plantation visited covers about 83 acres. It was originally planted with a mixture of trees, chiefly Douglas fir and Sitka spruce. In the drier places the firs are the larger, but in most places the spruces have suppressed all other trees. The wood has not been thinned, but the trees do not appear to have suffered on that account. The other wood is entirely Sitka spruce. I was informed that Professor Mayr, of Munich, considered these the two best plantations of Sitka spruce in Europe. From their condition they go far to justify the extensive plantations of this tree which are being made in some quarters on wet exposed land.

The gardens at Durris are extremely interesting, for they are attractively situated, and contain a good collection of trees, shrubs and other plants. Many of the trees are very well developed, and numerous conifers, ranging in height from 70 to 100 feet, retain their branches to the ground. *Abies grandis*, *A. Lowiana*, *A. Pinsapo*, *Thuya plicata* and *Pseudotsuga Douglasii* were prominent. A specimen of the latter, 72 years old, measured 106 feet in height

and 12 feet in girth at 5 feet from the ground. Its estimated timber contents are 300 cubic feet.

A large nursery, devoted chiefly to the raising of young forest trees, contained a good collection of young ornamental trees and shrubs also. Amongst the latter was a fine specimen of the Tasmanian *Athrotaxis laxifolia* about 12 feet high, which had stood uninjured for eight years, although on one occasion the temperature fell to zero.

XXXIX.—A NEW BUCHU FROM SOUTH AFRICA.

(*Barosma Peglerae*).

R. A. Dümmer.

The terms *Buchu*, *Bukku*, or *Bucco* are loosely applied by natives of the Cape Colony to various members of the genera *Agathosma*, *Diosma* and *Barosma* of the Natural Order *Rutaceae*, which, owing to the oleaginous and mucilaginous properties contained within their leaves, constitute a domestic medicine of no little repute.

By infusing the leaves in vinegar, brandy or 'dop,' their therapeutic properties are freed and the subsequent "Buchu Vinegar" or "Buchu Brandy" is then used for sundry internal complaints, although as MacOwan[1] remarks, "in these cases its chief value perhaps is the excuse and cover it affords for the occasional dose of alcohol." Be that as it may, their value as embrocations in sprains, contusions, &c., is held in high esteem, nor have their importance in alleviating rheumatic troubles been questioned.

The standard Buchus, however, comprise only three species of *Barosma*, namely, *B. serratifolia*, Willd., *B. crenulata*, Hook., and *B. betulina*, Bartl. and Wendl. f., known in the trade as "Longs," "Ovals" and "Short-broad," "Obovate" or "Rounds" respectively, though in recent years the leaves of the latter have been preferred and constitute now the "Folia Buchu," or "Folia Bucco" of the British Pharmacopoeia. These are chiefly valued as a diuretic, in catarrh of the bladder and in prostatic troubles.

The encouraging prices realised within recent years on the London markets have materially stimulated the industry of Buchu collecting, and with a view to furthering this stimulus, Mr. N. S. Pillans[2] has written a preliminary article, pending the results of certain investigations instituted by the Government, relating to the subject; the writer therein touches upon the history of the industry, mode of collecting and drying, quoting also statistics which indicate the steady increase in export and prices realised.

As considerable confusion has hitherto prevailed regarding the taxonomic limits of certain of the species and attempts at adulteration have not been infrequent, a critical revision of the genus has been undertaken with a view to facilitating the recognition of standard species, their occasional substitutes and the detection of spurious Buchus. These have been figured and will appear with descriptions in a subsequent issue of the Agricultural Journal of the Union of South Africa.

Specimens of a Buchu communicated to Kew during the year 1907, collected by Miss Alice Pegler on grassy slopes at the Qolora

[1] Agric. Journ., Cape of Good Hope, vi, 146 (1893).
[2] Agric. Journ., Cape of Good Hope, xxxvii., 252 (1910).

Mouth, Kentani, in the Eastern Regions of Cape Colony, appear to be new to science, and in order to direct attention to this species, which may be worth exploiting, this preliminary note with a diagnosis of the new species has been prepared.

Barosma Peglerae, *Dümmer*,* habitu *B. lanceolatae*, Sond. (sensu lato) similis, sed foliis latioribus ellipticis subtus fere epunctatis.

Planta perennis e basi lignosa ramosa, caulibus lignescentibus ascendentibus gracilibus ad 18 cm. altis simplicibus vel pauciramosis teretiusculis castaneis inferne nudis glabris cicatricibus prominulis superne dense foliatis minute puberulis. *Folia* alternatim disposita vel subopposita, subimbricata vel patula, brevissime petiolata, oblongo-elliptica, apice obtuso glandula notata, 1–1·5 cm. longa, 4–5 mm. lata, coriacea, mox glabra, supra nitentia, subconvexa, laevia, costa vix prominente, subtus pallidiora, eglandulosa vel glandulis paucis inconspicuis conspersa, margine paulo incrassata recurvaque fere integra et glandulis impressis ornata. *Flores* lilacini (fide *Pegler*), apicem versus ramulorum racemose dispositi, axillares, solitarii, gemini ternive, pedunculis filiformibus puberulis mox glabris 0·5–1 cm. longis bracteis basilaribus minutis munitis. *Calyx* glaber, 5-partitus, segmentis late deltoideis obtusis 1 mm. longis apicem versus glanduliferis denticulatis. *Petala* elliptico-oblonga, obtusa, 5 mm. longa, 2·5 mm. lata, in sicco albida. *Stamina* glaberrima, petalis aequilonga vel longiora, antheris glandula parvula terminatis; staminodia lanceolata, subacuta, 2 mm. longa, glandula obsoleta apicali notata, margine ciliolata. *Pistillum* glabrum, interdum abortivum, stylo carnosulo petalis fere duplo brevius, stigmate truncato.

1. Branch with Flowers.
2. Leaf. 3. Flower.

* The following is a translation of the Latin diagnosis :—

A *perennial* plant developing annual leafy and flowering shoots from a woody root-stock ; shoots slightly woody, ascending, slender, 7–9 inches high, simple or sparingly branched, nearly terete, chestnut brown, leafless, glabrous, and with prominent leafscars or aborted leaf-buds towards the base, densely leafy and minutely downy towards the apex. *Leaves* alternately disposed or subopposite, subimbricate or spreading, very shortly petiolate, oblong-elliptic with an obtuse gland-tipped apex, $\frac{2}{5}$ to over $\frac{1}{2}$ in. long, $\frac{1}{6}$–$\frac{1}{5}$ in. broad, leathery, glabrous, shiny, light green ; slightly convex and smooth above with a scarcely prominent midrib, paler below with a few scattered inconspicuous glands, the margin slightly thickened and recurved, almost entire and impressedly glandular. *Flowers* lilac, racemosely disposed towards the ends of the shoots, axillary, solitary, in pairs or threes, the peduncles filiform, puberulous or glabrous, $\frac{1}{4}$–$\frac{1}{3}$ in. long, subtended by minute basilar bracts. *Calyx* 5-partite, glabrous, with broadly deltoid obtuse segments $\frac{1}{24}$ in. long, gland-bearing towards their apices, and denticulate. Petal elliptic-oblong, obtuse, $\frac{1}{5}$ in. long, $\frac{1}{10}$ in. broad. *Stamens* entirely glabrous, equalling the petals in length or longer, the anthers terminated by a small gland ; staminodes (infertile stamens) lanceolate, subacute, $\frac{1}{12}$ in. long, furnished with an obsolete apical gland, ciliolate. *Pistil* glabrous, occasionally aborted ; style thickish, half as long as the petals and terminated by a truncate stigma.

South Africa. Eastern Region: Kentani; Qolora Mouth, grassy slopes, 30 m., *Pegler*, 33.

The species exhibits an affinity to forms of *Barosma lanceolata*, Sonder, but is readily distinguished by the broader, elliptic leaves, which are moreover inconspicuously glandular on their lower surfaces. Whether these will subsequently be of pharmaceutical importance must be decided by experiment; their size and glabridity however favour their trial, and though the glands are inconspicuous, pharmacologists assert that the value of the leaves is not solely dependent on the oil-extractive, but is intimately associated with their mucilaginous contents.

XL.—DIAGNOSES AFRICANAE, L.

1391. **Adenandra Schlechteri**, *Dümmer* [Rutaceae-Diosmeae]; ab *A. brachyphylla*, Schlechtendal, caulibus simplicibus, foliis majoribus obtusis subtus eglandulosis, floribus minoribus, pedicellis calycibusque albo-hirsutulis distat.

Caules simplices, fere stricti, graciles, lignescentes, inferne brunei, teretes, apicem versus citrini, angulati, puberuli, ad 5 dm. longi, foliis obtecti. *Folia* imbricata, brevissime complanato-petiolata, anguste elliptica vel obovato-elliptica, obtusa, 5–8 mm. longa, 3–4 mm. lata, coriacea, laete viridia, utrinque glabra, margine incrassata paulo recurva glandulisque impressis inconspicuis ornata. *Umbella* 8–10-flora, pedicellis albo-hirsutulis ad 8 mm. longis. *Calyx* 5-partitus, circiter 5 mm. longus, extra albo-hirsutulus, intra glaber, lobis ovatis concavis subacutis ciliatis. *Petala* brevissime et late unguiculata, late ovata, subacuta, tota 7 mm. longa, 4 mm. lata, glabra, albo-rosea. *Stamina* fertilia 2 mm. longa, antheris majusculis parce pilosis et glandula stipitata terminatis; staminodia staminibus fere duplo longiora, capitata, filamentis patenter pilosis. *Stylus* brevissimus, discum vix excedens; stigma truncatum.

South Africa. Coast Region: Bredasdorp Div.; Koude Rivier, 120 m. *Schlechter*, 10,467.

1392. **Agathosma Burchellii**, *Dümmer* [Rutaceae-Diosmeae]; *A. chortophilae*, Ecklon et Zeyher, affinis, sed habitu patulo, ramulis castaneis, foliis longioribus obtusis supra convexis subtus sulcatis omnino puberulis, umbellis paucifloris facile distinguenda.

Frutex circiter 6 dm. altus, divaricato-ramosus, partibus junioribus ubique corollis exceptis puberulis, ramulis ultimis castaneis gracilibus ad 5 cm. longis foliis obtectis. *Folia* plerumque ternata, primo ascendentia, mox patentia, internodiis longiora, brevissime complanato-petiolata, linearia, obtusa, 5–8 mm. longa, 0·7–1 mm. lata, carnosula, supra convexa, subtus sulcata, marginibus incrassatis revolutis valde impresso-punctatis. *Flores* axillares, interdum solitarii vel in umbellas terminales 2–5-floras dispositi, pedicellis ad 6 mm. longis bracteolatis suffulti. *Calyx* 5-partitus, extra puberulus, intus glaber, segmentis ovato-oblongis obtusis marginibus involutis ciliolatis glandulis ornatis. *Petala* patentia, anguste obovato-oblonga, 2 mm. longa, alba, roseo-tincta, glandula glabra aut pilifera fusca terminata, margine inferne ciliolata. *Stamina* glabra, petala aequantia; staminodia anguste elliptica, acuta, pubescentia,

staminibus triplo vel quadruplo breviora. *Stylus* glaber, stamina vix superans, apice obtuso. *Carpella* 4 mm. longa, glabra, atrocastanea, muricato-glandulosa.

South Africa. Coast Region: Riversdale Div.; dry hills near Spiegel River, Dec. 1814. *Burchell*, 7205.

A species with the facies of *Barosma microcarpa*, Sonder, but the umbellate disposition of the flowers suggests its approximation to the closely allied and scarcely separable genus *Agathosma*.

1393. **Kalanchoe Ellacombei**, *N. E. Brown* [Crassulaceae]; affinis *K. platysepalae*, Welw., sed planta hirsutior sepalis acuminatis et corolla glanduloso-puberula.

Herba annua vel biennis, erecta, 3·5–5 dm. alta. *Caulis* 3–6 mm. crassus, inferne glaber, superne pilis glandulosis patulis conspicue pubescens; rami oppositi, erecti, subparalleli, racemis bifidis parallelis 5–10 cm. longis multifloris terminati, glanduloso-pubescentes. *Folia* opposita, sessilia, 3–9 cm. longa, 0·7–3 cm. lata, anguste oblonga vel oblongo-lanceolata, obtusa vel subacuta, integra, inferiora glabra, superiora utrinque glanduloso-puberula. *Flores* alterni. *Bracteae* 3 mm. longae, lineares, acutae, deciduae. *Pedicelli* 3 mm. longi, glanduloso-pubescentes. *Calyx* 7–8 mm. longus, 4-lobus, glanduloso-puberulus, viridis; lobi 5–6 mm. longi, 2·5 mm. lati, ovato-lanceolati, acuminati. *Corolla* 4-loba, aurantiaca, extra glanduloso-puberula; tubus 1 cm. longus; lobi 5 mm. longi, 3·5–4 mm. lati, elliptici, obtusi, subulato-apiculati. *Stamina* inclusa. *Squamae hypogynae* 2·5 mm. longae, lineares, submembranaceae.

Tropical Africa. Rhodesia: Livingston and by the River Zambesi 5 miles above Victoria Falls, *Ellacombe*.

1394. **Begonia (Fusibegonia) parva**, *Sprague* [Begoniaceae]; affinis *B. Mannii*, Hook. f., a qua foliis minoribus minus obliquis, floribus minoribus, femineis solitariis, antheris longioribus recedit.

Caulis herbaceus, circiter 3 dm. longus, teres, circiter 4 mm. diametro, pilis stellatis brunneo-pubescens; internodia 2–4 cm. longa. *Folia* ovata, acute acuminata, apice recurva, basi leviter inaequaliter cordata, 10–11 cm. longa, 5 cm. lata, supra subopaca, glabra, laevia, subtus pilis stellatis brunneo-pubescentia, nervo medio prominente; nervi laterales utrinque circiter 4, satis obliqui; petioli plus minus rubri, 1·5–3·5 cm. longi; stipulae lanceolatae, acute acuminatae, 1·7–2 cm. longae, extra stellato-pubescentes. *Perianthii segmenta* saturate rosea. *Cymae* ♂ ter bifurcatae; pedunculus communis 1·2 cm. longus; pedunculi proprii florum 1 mm. longi; pedicelli 7–8 mm. longi. *Perianthii segmenta* exteriora 2, elliptico-oblonga, 1·1 cm. longa, 5·5 mm. lata; segmenta interiora 2, oblanceolato-oblonga, 1·05 cm. longa, 2·7 mm. lata, subacuta. *Androphorum* in toto vix 2 mm. longum, rubrum, parte inferiore stipitiformi 1 mm. longa. *Antherae* 15, inferiores sessiles, 3 superiores filamentis 0·3 mm. longis, 3 mm. longae, connectivo 0·25 mm. ultra loculos producto. *Flores* ♀ solitarii; pedicellus 3·5–4 mm. longus. *Perianthii segmenta* exteriora 2, elliptico-oblonga, 13 mm. longa, 8 mm. lata, extra parce stellato-pilosa; segmenta interiora oblanceolata, 1·2 cm. longa, 4·5 mm. lata. *Ovarium* 1·3–1·5 cm. longum, dense stellato-pubescens, 3-loculare

vel 4-loculare, placentis 2 pro loculo ; styli 3 vel 4, basi 0·5 mm. connati, 2·5–3 mm. longi, aurantiaci (5·5 mm. longi stigmatibus inclusis) ; stigmata 3–3·5 mm. longa, rubra.

Tropical Africa. Congo State. Described from a living plant received from the Botanic Garden, Brussels.

1395. **Vernonia crataegifolia,** *Hutchinson* [Compositae-Vernonieae]; affinis *V. corymbosae,* Less., sed foliis sessilibus vel subsessilibus subtus tenuiter arachnoideo-pubescentibus differt.

Planta 1·25–1·6 m. alta, multicaulis ; caules subteretes, arachnoideo-tomentosi, plerumque dense foliati. *Folia* alterna vel subalterna, sessilia vel subsessilia, elliptica, obovato-oblanceolata vel (in ramulis sterilibus) suborbicularia, basi cuneata, 2·5–9 cm. longa, 1·5–7 cm. lata, membranacea vel tenuiter rigide chartacea, utrinque tenuiter arachnoideo-pubescentia vel fere glabra, subtus glandulis flavis dense instructa, grosse repando-dentata vel subpinnatifida, dentibus plus minusve triangularibus acute mucronatis, nervis lateralibus utrinque 5–6 rectis vel leviter arcuatis infra prominentibus intra marginem conspicue ramosis. *Corymbi* usque ad 15 cm. expansi, foliosi. *Capitula* 4–5-flora, anguste obovoidea vel subcylindrica, circiter 6 mm. diametro, 6–8 mm. longa. *Involucri bracteae* 4-seriatae, ellipticae vel oblongo-ellipticae, apice rotundatae, extra apicem versus pubescentes. *Pappi setae* numerosae, interiores corollae tubo paulo longiores, exteriores multo breviores, omnes minute barbellatae. *Corolla* lilacina (*Pegler*) vel purpurea (*Tyson*) ; tubus 5 mm. longus, medio 0·5 mm. diametro, minute glandulosus ; lobi lanceolato-lineares, subobtusi, 3 mm. longi, vix 0·75 mm. lati, glabri. *Antherae* 2·5 mm. longae. *Stylus* 6 mm. longus, ramis 2 mm. longis. *Achaenia* 2 mm. longa, pilosa, dense glandulosa.— *Vernonia mespilifolia,* E. Meyer in Drège, Zwei Pfl. Documente, 152, 228, non Lessing.

South Africa. Eastern Region : Transkei Div. ; Kentani district, in valleys (April), *Pegler,* 999. Pondoland ; between St. Johns River and Umsikaba River, 305–610 m. (May), *Drege, a* and *b.* East Griqualand ; Shawbury (May), *Baur,* 219 ; near Clydesdale (March), *Tyson,* 1188, 1242. Natal ; Tugela River, Colenso, *Rehmann,* 7184 ; and without precise locality, *Gerrard,* 711 ; *Cooper,* 2579. Kalahari Region : Transvaal ; Kaap Valley, Barberton (April), *Galpin,* 1350.

This species is most closely allied to *V. corymbosa,* Less., and *V. mespilifolia,* Less., and it has even been associated with the latter in the Drègean herbarium. From both, however, it may readily be distinguished by its sessile or subsessile, coarsely toothed leaves, and from the former more especially by the loose indumentum on their lower surfaces.

1396. **Maba Dawei,** *Hutchinson* [Ebenaceae] ; affinis *M. natalensi,* Harv., sed foliis leviter emarginatis, floribus pedicellatis in cymis 2–3-floris dispositis differt.

Suffrutex ; rami graciles, flexuosi, teretes, breviter pubescentes ; ramuli floriferi graciles, patuli, pubescentes, internodiis 0·5–1 cm. longis. *Folia* elliptica, ovato-elliptica vel rhomboideo-elliptica, leviter emarginata, basi subcuneata, 1·5–2·5 cm. longa, 0·7–1·5 cm. lata, chartacea, glabra, utrinque subnitida, juniores breviter ciliata, distincte reticulata ; petioli 2 mm. longi, rugulosi, pubescentes.

Cymae ♂ axillares, 2–3-florae ; pedunculi circiter 2 mm. longi, breviter pubescentes ; pedicelli 1–1·5 mm. longi, glabri vel parce puberuli, apice articulati. *Calyx* campanulatus, truncatus, basi leviter constrictus, 2·5–3 mm. longus, vix 3 mm. diametro, utrinque glaber, parce ciliolatus. *Corolla* triloba ; tubus campanulato-obconicus, 2·5 mm. longus ; lobi ovato-oblongi, submucronati, circiter 2·5 mm. longi et lati, margine incurva, extra appresse pilosi, intra glabri. *Stamina* circiter 15, basi corollae tubo adnata ; filamenta distincta, vix 0·5 mm. longa ; antherae 1·75 mm. longae, breviter apiculatae. *Flores* ♀ non visi.

Tropical Africa. Portuguese East Africa: Goruro, in forests (Jan.), *Dawe*, 524.

1397. **Utricularia odontosepala**, *Stapf* [Lentibulariaceae]; affinis *U. Welwitschii*, Oliver, sed sepalis inciso-serratis valde insignis.

Herba gracilis, terrestris, annua. *Rhizoidea* foliaque ignota. *Scapus* filiformis, 10–12 cm. altus, simplex vel parce ramosus. *Flores* valde dissiti, pauci ; bracteae subulato-lanceolatae, ad 1 mm. longae ; bracteolae iis simillimae ; pedicelli brevissimi vel ad 1 mm. longi. *Sepala* ambitu rotundato-ovata, inciso-serrata, dentibus utrinque 3 acutis, 1·5–1·75 mm. longa, flavida. *Corolla* 7–8 mm. longa, violaceo-purpurea, palato aureo ; labium superum late ovatum, emarginatum, 3 mm. longum ; labium inferum vix 4 mm. longum, subrotundum, palato bi-gibboso laevi ; calcar gracile, acutum, descendens, vix 1 cm. longum. *Antherae* vix 1 mm. longae. *Pistillum* oblique lageniforme, stylo brevi, stigmatis labiis latis minute papillosis, inferiore prc rata amplo. *Capsula* seminaque ignota.

Tropical Africa. N. W. Rhodesia : Kashitu River, *Rogers*, 8632.

1398. **Graphtophyllum glandulosum**, *Turrill* [Acanthaceae-Acanthoideae]; ab affini *G. picto*, Griff., foliis distincte acuminatis, corollae tubo et calyce glanduloso, staminibus dorso pubescentibus recedit.

Caulis erectus, quadrangularis, parce pubescens vel glaber. *Folia* elliptico-lanceolata, apice acuminata, basi cuneata, usque ad 20 cm. longa et 6 cm. lata, infra minute puberula, supra conspicue cystolithigera, margine integra, nervis lateralibus utrinque circiter 10 in pagina utraque distinctis, petiolis 2 cm. longis suffulta. *Flores* in paniculam terminalem dispositi ; bracteae lineares, 2 mm. longae, minute puberulae ; bracteolae minutae. *Calyx* quinquepartitus, segmentis linearibus acutis 3 mm. longis extra glandulosis. *Corollae tubus* inferne cylindricus, superne ampliatus, 2 cm. longus, extra glandulosus ; labium posticum breviter bilobatum, 9 mm. longum, 2 mm. latum, anticum tripartitum, segmentis 1 cm. longis 3 mm. latis. *Stamina* 2, filamentis exsertis, 1·5 mm. longis leviter pubescentibus ; antherarum loculi 2, aequales, mutici, dorso pubescentes ; pollinis granula breviter ellipsoidea, 50 μ longa, 40 μ diametro. *Discus* 1 mm. altus. *Ovarium* 2 mm. altum, 1 mm. diametro, glabrum, loculis 2-ovulatis ; stylus 2·5 cm. longus, leviter pubescens.

Tropical Africa. Southern Nigeria : Oban District, *Mr. and Mrs. P. A. Talbot* ; Cross River, Ifunkpa-Atakom, *J. H. Holland*, 216. Cameroons: Johann-Albrechtshöhe, forest region, *Staudt*, 455.

1399. **Blepharis Evansii**, *Turrill* [Acanthaceae-Acanthoideae]; *B. madanensi*, S. Moore, affinis, sed floribus minoribus differt.

Rami teretes, albo-pubescentes. *Folia* lineari-lanceolata, sessilia, spinuloso-acuminata, 4–5 cm. longa, 6–8 mm. lata, subcoriacea, utrinque albo-pubescentia, marginibus spinosa. *Inflorescentia* terminalis vel lateralis, congesta, multiflora, albo-pubescens; bracteae steriles lineari-lanceolatae, spinuloso-acuminatae, 1·2 cm. longae, 4 mm. latae, pubescentes, fere integrae, fertiles bracteolaeque lineares, spinuloso-acuminatae, 2 cm. longae, 4 mm. latae, albo-pubescentes, marginibus spinulosae. *Calycis* lobi 4; anticus oblongo-lanceolatus, apice bilobatus, quinquedentato-spinulosus, 1·7 cm. longus, 6 mm. latus, pubescens; posticus oblongo-lanceolatus, apice tridentatus, 2·2 cm. longus, 6 mm. latus, pubescens; laterales lineares, apice spinuloso-acuminati, 1·7 cm. longi, 2 mm. lati, pubescentes. *Corollae* tubus 1 cm. longus, glaber; limbus trilobatus, lobo intermedio minore, 1·7 cm. longus, 1 cm. latus, pubescens, caeruleus. *Stamina* 4, filamentis 5 mm. longis glabris; antherae 5 mm. longae, staminum anticorum lobis fertilibus quam sterilibus tertia parte longioribus; pollinis granula longe ellipsoidea, circiter 40 μ longa, 25 μ diametro. *Ovarium* 3 mm. altum, 1·5 mm. diametro, glabrum; stylus 1·3 cm. longus, glaber, breviter aequaliterque bifidus.

Tropical Africa. British East Africa: Guasa Nyiro; "among quartz," Lion Camp, *Maurice S. Evans*, 754.

1400. **Cleistanthus gabonensis**, *Hutchinson* [Euphorbiaceae-Phyllantheae]; affinis *C. bipindensi*, Pax, sed floribus subsessilibus, discis minoribus et tenuioribus, staminibus numerosioribus, antheris majoribus subsessilibus differt.

Arbor 6–10 m. alta; rami breviter pubescentes; ramuli juniores patuli, angulares, pubescentes vel demum fere glabri. *Folia* oblonga vel oblongo-elliptica, subacute caudato-acuminata, acumine circiter 1·2 cm. longo, basi rotundata, 5·5–11 cm. longa, 3–5 cm. lata, chartacea vel tenuiter coriacea, saepe supra glauca, subtus pallide viridia, utrinque glabra et opaca, nervis lateralibus utrinque 4–6 arcuatis, nervis tertiariis gracilibus subparallelis crebris distinctis; petioli circiter 4 mm. longi, transverse rugosi, breviter pubescentes; stipula non visae. *Flores* monoici, axillares, 3–4-fasciculati, ♀ solitarii, ceteri ♂, omnes subsessiles. *Flores* ♂: *Sepala* ovato-lanceolata, subobtusa, 5 mm. longa, 2 mm. lata, extra dense rufo-tomentella, intra glabra. *Petala* oblanceolata, subacuta, 1·5 mm. longa, carnosa, glabra. *Discus* parvus, carnosus, pubescens. *Stamina* 7–10; filamenta brevissima; antherae 2·5 mm. longae, glabrae. *Ovarii rudimentum* dense rufo-villosum. *Flores* ♀: *Sepala* et petala ut in floribus ♂. *Discus* tenuis, margine et intra longe villosus. *Ovarium* dense rufo-villosum; styli tomentosi, multifidi. *Capsula* triloba, circiter 1·2 cm. longa, 2 cm. diametro, dense rufo-villosa et crispe pubescentia. *Semina* 7 mm. longa, nitidula.

Tropical Africa. Gaboon: neighbourhood of Libreville, *Klaine*, 3422, 3432.

This species is remarkably similar to *C. bipindensis*, Pax, from which it can scarcely be separated except by dissection and comparison of the flowers. It differs in its subsessile flowers, smaller and thinner male and female disks, more numerous stamens, and larger, subsessile anthers.

1401. **Drypetes aframensis**, *Hutchinson* in Dyer, Fl. Trop. Afr., vol. vi., sect. i., p. 682, *anglice* [Euphorbiaceae-Phyllantheae]; *D. leonensi*, Pax, facie similis sed staminibus numerosioribus differt.

Arbor circiter 14 m. alta; ramuli leviter sulcati, glabri. *Folia* elliptica vel oblongo-elliptica, brevissime et paulo abrupte acuminata, basi cuneata et leviter inaequalia, 5-10 cm. longa, 2·5–4·5 cm. lata, rigide chartacea, utrinque glabra et opaca vel nitidula, nervis lateralibus utrinque circiter 7 intra marginem anastomosantibus utrinque distinctis subtus leviter elevatis; petioli 3–4 mm. longi, leviter rugosi, glabri; stipulae parvae, coriaceae, caducae. *Flores* ♂ axillares, in ramulis junioribus fasciculati; pedicelli 3–4 mm. longi, glabri. *Sepala* 4, obovata vel oblongo-obovata, obtusa, 2·5 mm. longa, 1·5 mm. lata, apice pubescentia, membranacea. *Stamina* 8; filamenta gracilia, glabra; antherae parvae, glabrae. *Discus* magnus, cupularis, glaber, margine irregulariter dentatus. *Flores* ♀ non visi.

Tropical Africa. Upper Guinea: Gold Coast; Afram Plains, *W. H. Johnson*, 714.

1402. **Drypetes Paxii**, *Hutchinson* in Dyer Fl. Trop. Afr., vol. vi. sect. i, p. 681, *anglice* [Euphorbiaceae-Phyllantheae]; affinis *D. bipindensi*, Hutchinson (*Cyclostemon bipindensis*, Pax), sed stipulis multo minoribus staminibus 4 facile distinguenda.

Ramuli graciles, sulcati, minute puberuli. *Folia* oblonga vel oblongo-elliptica, caudato-acuminata, basi subcuneata et leviter inaequalia, 7·5–11·5 cm. longa, 4–4·5 cm. lata, tenuiter chartacea vel submembranacea, integra, utrinque glabra, supra nitida, nervis lateralibus utrinque 10–11, pergracilibus patulis intra marginem anastomosantibus, venis et venulis leviter prominentibus; petioli graciles, 4–6 mm. longi, densiuscule puberuli; stipulae deciduae, parvae. *Flores* ♂ axillares, in ramulis foliosis fasciculati; pedicelli graciles, 3 mm. longi, dense puberuli. *Sepala* 4, oblonga, obtusa, 2 mm. longa, 1 mm. lata, utrinque puberula, ciliata. *Stamina* 4; filamenta gracilia, basin versus gradatim latiora, glabra; antherae oblongo-ellipsoideae, 0·35 mm. longae. *Discus* cupularis, tenuis, dentatus, intra pubescens, extra glaber. *Flores* ♀ non visi.

Tropical Africa. Upper Guinea: Cameroons; Bipinde, *Zenker*, 3788.

1403. **Drypetes similis**, *Hutchinson* in Dyer, Fl. Afr. Trop., vol. vi. sect. i, p. 679, *anglice* [Euphorbiaceae-Phyllantheae]; affinis *D. glomeratae*, Hutchinson (*Cyclostemon glomeratus*, Muell. Arg.), sed floribus pedicellatis, sepalis extra glabris differt.

Arbor; ramuli teretes, cortice cinereo glabro obtecti. *Folia* magna, oblongo-elliptica, breviter acuminata, basi cuneata vel subobtusa, 30–35 cm. longa, 9–13 cm. lata, coriacea, utrinque glabra et nitida, nervis lateralibus utrinque 8–9 patulis vel ascendentibus prope marginem anastomosantibus supra leviter insculptis subtus prominentibus, venis laxis subtus leviter elevatis; petioli crassi, 1·3 cm. longi, glabri; stipulae subpersistentes, lanceolatae, obtusae, 0·8–1·2 cm. longae, crassae, interdum fere subteretes, glabrae. *Flores* ♂ versus basin ramulorum dispositi; pedicelli circiter 4 mm. longi, robusti, angulares vel sulcati, glabri. *Sepala* 5, rarius 4, oblongo-oblanceolata, vix 4 mm. longa,

1·5 mm. lata, superne dentata, coriacea, glabra. *Stamina* 4 vel 5, circum disco inserta ; filamenta crassa, glabra ; antherae rotundatae, 1·5 mm. longae. *Discus* patelliformis, crassus, undulatus, glaber. *Flores* ♀ pauci, apices ramulorum versus dispositi ; pedicelli robusti, fructiferi demum circiter 1·3 cm. longi, glabri. *Discus* crassus, annularis, glaber. *Ovarium* ellipsoideum, glabrum ; styli breves ; stigma rotundatum, integrum. *Fructus* ellipsoidei, circiter 1·3 cm. longi, 1 cm. diametro. *Semina* matura non visa.

Tropical Africa. Upper Guinea : Cameroons ; Bipinde, *Zenker*, 3194, 3527, 3721. Ilendi, *Ledermann*, 654.

1404. **Tragia (Tagira) affinis**, *Muell. Arg. MSS. in Herb. Holm.* [Euphorbiaceae-Crotoneae]; species *T. rupestri*, Sond., quam maxime affinis sed foliis minoribus glabratis basi haud 3–lobis capsulisque minoribus apte distinguenda.

Herba, caules elongati, graciles, prostrati vel volubiles, ramosi ; rami puberuli parce pilis urentibus armati. *Folia* breve petiolata, membranacea, triangulari-ovata, acuta, basi breve cordata sinu latiore, margine crebre dentata, utrinque pilis urentibus perpaucis secus nervos obsita ceterum glabra, 2–3 cm. longa, 1–1·5 cm. lata ; petioli puberuli et pilis urentibus perpaucis onusti, 7–9 mm. longi ; stipulae lanceolatae, reflexae, 2–3 mm. longae, glabrae. *Racemi* terminales oppositi foliique, graciles, densi, 3–5 cm. longi, pedunculo nudo gracile puberulo et parce pilis urentibus obsito 1 cm. longo suffulti, flores masculos versus apicem plurimos femineosque 1–2 basales gerentes ; pedicelli sub quaque bractea singuli, maris 1–2 mm. longi, glabri, bracteis breviores ; bracteae maris lanceolatae, 2 mm. longae, margine minute ciliolatae ; bracteae feminei ovatae acute margine dentatae, bracteolae lanceolatae. ♂ *Sepala* 3, ovata, acuta, glabra. *Stamina* 3, filamenta antheris subaequilonga apice incurva. ♀ *Sepala* saepissima 3, nonnunquam 4, ambitu suborbicularia, membranacea, demum accrescentia vix tamen coriacea 6 mm. longa, margine palmatim utrinsecus 4–5-lobulata, extra parce pubescentia. *Ovarium* dense setosum ; styli 3, basi breviter connati, apice recurvi. *Capsula* 3-cocca, parcius pilosa, 6 mm. lata ; cocci subglobosi. *Semina* globosa, brunnea.—*T. rupestris*, β, *glabrata*, Sond. in Linnaea xxiii. 108 ; Muell. Arg. in DC. Prodr. xv. 2, 940 ; *T. rupestris*, γ, *minor*, Muell. Arg. in DC. Prodr. xv. 2, 940 partly and as to Wahlberg's specimen only ; not *T. minor*, Sond.

South Africa. Kalahari Region : Transvaal ; Vaal River, *Zeyher*, 1526 ; *Burke* ; Crocodile River, *Burke* ; without precise locality, *Wahlberg*.

This species is very nearly related to *T. rupestris*, Sond., with which indeed it has been united by Sonder, and bears to this species something like the relationship that *T. durbanensis*, O. Kuntze (*T. Meyeriana*, β, *glabrata* Muell. Arg.), bears to *T. Meyeriana* (*T. Meyeriana*, α, *hirsuta*, Muell. Arg. = *T. Bolusii*, O. Kuntze). In the case of the two last-mentioned plants it is found, now that ample material of both is available, that we have to deal with two readily distinguishable species. The material of the species now described is less ample and, with the specimens at his disposal, the conclusion arrived at by Sonder was not unnatural. But in addition to the material collected by Zeyher and Burke

there are in the Stockholm Herbarium certain specimens, agreeing with the ones named by Sonder, collected by Wahlberg; these have been kindly placed at our disposal for study by Dr. C. A. M. Lindman. Wahlberg's specimens have also been examined by Mueller, and in dealing with them that author has practically recognised the fact that this plant is not referable to *T. rupestris*, Sond. One of them he has named *T. rupestris*, γ, *minor*, and has cited it under this name in the *Prodromus*. Another, evidently part of the same gathering, Mueller has written up as *Tragia* (*Tagira*) *affinis*, Muell. Arg. This latter name has never been taken up, and we are therefore fortunately able to conserve it in connection with a plant which, now that there is ample material of *T. rupestris*, Sond. at our command, is seen to be distinct from Sonder's type of that species.

1405. **Tragia (Tagira) collina**, *Prain* [Euphorbiaceae-Crotoneae]; species *T. incisifoliae*, Prain, habitu congruens sed foliis minus incisis, calyce femineo 3-partito, coccis dorso parum angulatis differt.

Herba caulibus brevibus herbaceis e basi lignoso simplicibus vel parce ramosis, 10–15 cm. altis, parce vel distincte pubescentibus, aculeisque paucis armatis *Folia* fere sessilia, membranacea, oblonga, obtusa, basi late cuneata vel truncata, margine basi integra, secus latera parce dentata dentibus nonnunquam obsoletis, apice grosse 3–5-dentata, 0·8–1·2 cm. longa, 6–8 mm. lata, utrinque secus nervos parce hirsuta aculeataque; petiolus 1–2 mm. longus, hirsutus aculeatusque; stipulae patentes lanceolatae, hirsutae, 3 mm. longae. *Racemi* oppositifolii subterminales 2·5–5 cm. longi, pedunculis dense pubescentibus 0·5–1 cm. longis suffulti, floribus masculis pluribus femineisque basalibus 1–3 onusti; pedicelli utriusque sexus sub quaque bractea solitarii eaque breviores; bracteae bracteolaeque lanceolatae, integrae, subglabrae, bracteae maris 3 mm. longae, feminei 4 mm. longae. *Sepala* maris 3, ovata, apiculata, extra puberula. *Stamina* 3, erecta, filamentis basi incrassatis antheris longioribus. *Sepala* feminei 3, accrescentia, subcoriacea, suborbicularia, utrinsecus pinnatim 5–6-lobulata, extra pubescens intus glabra; lobuli lanceolati, rhachidis diametro aequilongi. *Ovarium* dense setosum; styli 3, inferne in columnam glabram connati, dimidio superiore liberi, recurvi. *Capsula* 3-cocca, parce setosa, 8 mm. lata; cocci dorso parum angulati. *Semina* globosa.

South Africa. Natal: near Colenso, 1370 m., *Schlechter*, 3381; near Pieters, 915–1220 m., *Wood*, 8881.

A very distinct species, with the habit of *T. incisifolia* but with different leaves. As regards its flowers and fruits it most nearly approaches *T. angustifolia*, Benth. and *T. Kirkiana*, Muell. Arg. The flowers are stated by Mr. Medley Wood to be pink.

1406. **Tragia (Agirta) cocculifolia**, *Prain* [Euphorbiaceae-Crotoneae]; species *T. imerinicae*, Prain, proxima sed foliis majoribus densius strigosis haud aculeatis racemisque 1–sexualibus apte distinguenda.

Frutex ramis suberectis lignosis strictis vel subvolubilibus, dense pubescentibus, ramulis brevibus pilis retrorsis dense pubescentibus. *Folia* breve petiolata, membranacea, late oblonga vel ovata vel suborbicularia, obtusa vel acuta, basi parum cordata, margine

integra vel subundulata, 4–6 cm. longa, 2–4·5 cm. lata, utrinque distincte reticulata et secus nervos pilis patentibus elongatis densius strigosa nec tamen aculeata ; petiolus patenter pubescens, 1·5–2·5 cm. longus ; stipulae falcatae, erectae, acutae, 4 mm. longae, glabratae. *Racemi* (masculi tantum visi) terminales, 4–5 cm. longi, pedunculo dense pubescente perbrevi suffulti ; bracteae nisi ima lineari-spathulatae, acutae, subcucullatae, 2 mm. longae glomerulos 3-flores subtendentes, bractea ima fere basalis foliacea, suborbicularis, 5–7 mm. diametro, flos singulum masculum ceteris paullo majorem subtendens. *Sepala* maris saepius 3, nonnunquam 4, suborbicularia, obtusa, extra strigosa. *Stamina* 3, raro 4, centrum floris occupantia ; antherae sub anthesin reflexae, horizontales. *Flos femineus* haud visus.

MADAGASCAR. Central Madagascar, *Baron*, 1748, 3951.

Very similar to *T. imerinica*, but the leaves are less prominently reticulate, densely strigose but not at all aculeate, do not become so firmly papery when full grown, and are of larger size. Almost at the base of the racemes, in place of some distance above the base, occur large bracts (reduced leaves) exactly like the female bracts of *T. imerinica*. These leafy bracts, however, in place of subtending a glomerulus of female flowers as in *T. imerinica*, subtend solitary male flowers with longer pedicels and of larger size than the male flowers in the glomerules which occupy the remainder of the raceme.

1407. **Tragia (Agirta) imerinica**, *Prain* [Euphorbiaceae-Crotoneae]; species *T. Boivinianae*, Muell.-Arg., affinis sed foliis minoribus et bracteis flores femineos subtendentibus latissimis foliaceis suborbicularibus vel subreniformibus differt.

Frutex ramis suberectis lignosis parce pubescentibus vel glabris, ramulis parce puberulis strictis vel raro volubilibus. *Folia* breve petiolata, membranacea demum papyracea, triangulari-ovata, acuta vel obtusa, mucronulata, basi parum cordata vel truncata, margine distanter minutissime glanduloso-denticulata, 2·5–3 cm. longa, 1·5–2·5 cm. lata, utrinque secus nervos parce aculeis albidis obsita, adulta prominenter reticulata, minutissime puncticulata ; petiolus pubescens 1–1·25 cm. longus ; stipulae oblongae, erectae, subacutae, 2 mm. longae. *Racemi* terminales, 4–5 cm. longi, pedunculo parcissime puberulo 1-2 cm. longo suffulti, supra flores masculos prope basin flores femineos gerentes ; bracteae maris lineari-lanceolatae, patentes, 1 mm. longae, inferiores cymulas 2–3–floras, superiores flores singulos pedicellis medio bracteolatis suffultos subtendentes ; bracteae feminei foliaceae, suborbiculares vel reniformes, 5–7 mm. longae 5–9 mm. latae, flores sessiles 2–3 subtendentes. *Sepala* maris saepius 3, nonnunquam 4, suborbicularia, subacuta, extra puberula. *Stamina* 3, raro 4, centrum floris occupantia ; antherae sub anthesin reflexae, horizontales. *Sepala* floris feminei 6, lanceolata, acuta, extra pubescentia, sub anthesin ovario absque stylo aequilonga. *Ovarium* dense velutinum ; styli 3, dimidio inferiore in columnam connati. *Capsula* juvenilis tantum obvia, glabra.

MADAGASCAR. Central Madagascar, *Baron*, 2872. North-West Madagascar, *Baron*, 4989.

A very distinct species. The leaves in texture closely resemble those of *T.* (*Agirta*) *Boiviniana*, Muell. Arg., but are much smaller, have a different outline and relatively longer petioles. *T. imerinica* agrees with *T. Boiviniana* in having glomerulate female flowers, but the female calyx-segments are much smaller than in *T. Boiviniana*. The most striking differential character is, however, to be met with in the bracts subtending the female flowers which in *T. Boiviniana* are like the male bracts but in *T. imerinica* are like much reduced leaves.

1408. **Tragia (Tagira) Sonderi**, *Prain* [Euphorbiaceae-Crotonae]; species quoad folia magis *T. Dinteri*, Pax, accedens, differt tamen racemis masculis multo longioribus, bracteis majoribus, caulibus volubilibus.

Herba caulibus e basi ligroso suberectis demum volubilibus, metralibus, parce ramosis, parce pubescentibus et plus minusve pilis urentibus armatis. *Folia* longe petiolata, membranacea, triangulari-ovata, acuta, basi cordata, margine grosse dentata vel duplicato-dentata, 4–7·5 cm. longa, 2·5–6·5 cm. lata, utrinque parce pubescentia et secus nervos plus minusve setosa; petiolus minute puberulus et parce setosus, 2·5–6 cm. longus; stipulae lanceolatae, reflexae, glabrae, 4 mm. longae. *Racemi* laterales, oppositifolii, 1-sexuales, masculi 7·5–10 cm. longi, floribus plurimis dissitiusculis onusti, pedunculisque 1–1·5 cm. longis suffulti; flores inferiores in cymulas 3-floras aggregati, superiores subquaque bractea solitarii sed pedicellis basi iterumque medio 2-bracteolatis; bracteae lineari-lanceolatae, reflexae, 3 mm. longae. *Sepala* maris 3, lutea, ovata apiculata, glabra. *Stamina* 3; filamenta antheris longiora; antherae subconniventes. *Flores feminei fructusque* adhuc ignoti.

South Africa. Transvaal: Macalisberg, *Zeyher*; *Burke*. Swaziland: High Veld at Dalriach; near 'Mbabane, 1350 m., *Bolus*, 12,290.

A very distinct species with leaves like those of the German South-West African *T. Dinteri*, Pax, but with different habit and different male flowers. The original specimens were too imperfect for description, yet, imperfect as they were, they made it clear to Dr. Sonder that they represented a species of *Tragia* quite distinct from any of the ones described by him.

1409. **Leidesia firmula**, *Prain* [Euphorbiaceae-Crotoneae]; species ab alteris hujus generis caulibus ramisque firmulis nec succulentis, foliisque lanceolatis haud puncticulatis facile distinguenda.

Herba erecta, basi lignosa, intricatim ramosa, comam 15 cm. altam 18 cm. diametro efficiens. *Folia* breve petiolata, membranacea, ovato-lanceolata vel lanceolata, acuta, basi anguste cuneata, margine pubescente crebre minuteque crenulata, 1·2–1·8 cm. longa, 4–6 mm. lata, nisi margine ubique glabra; petiolus 2·5–3 mm. longus, glaber; stipulae lanceolatae, glabrae, 1 mm. longae. *Racemi* androgyni, superne florum masculorum glomerulos dissitos, ad basin florum femineorum glomerulum pauciflorum singulum gerentes; bracteae masculae ovatae, acutae, bracteolae oblongae, acutae, omnes margine et extra parce ciliatae; pedicelli maris calyce longiores, feminei capsula parum breviores, omnes articulati. *Calyx* maris

alte 3-partitus ; lobi ovati, acuti, extra parce ciliati. *Stamina* 3–4. *Capsula* 2-dyma ; cocci extra hispiduli, 2 mm. longi ; stigmata persistentia vel subpersistentia, simplicia, papillosa.

South Africa. German South-West Africa : Great Namaqualand ; Gamokab, *Schinz*, 898 ; Karukab, *Schinz*, 899 ; Groot Fontein, *Dinter*, 700.

1410. **Adenocline stricta**, *Prain* [Euphorbiaceae-Crotoneae]; species *A. ovalifoliae*, Turcz., quam maxime affinis sed caulibus rigidis internodiis abbreviatis foliisque sessilibus cum stipulis foliaceis basi confluentibus facillime distinguenda.

Herba dioica ; caules erecti, basi lignosi superne stricte virgatim ramosi, 20–22 cm. alti, internodi 0·8–1·2 cm. longi. *Folia* alterna, sessilia, firme membranacea, oblonga vel oblongo-lanceolata, acuta, basi lata ibique stipulis confluentia, margine argute serrata, 0·8–1·2 cm. longa, 5–6 mm. lata ; stipulae foliaceae foliis ipsis parum minores 5–8 mm. longae, 4–5 mm. latae. *Flores* masculi nondum visi ; feminei solitares, oppositifolii, pedicellati, pedicellis abrupte reflexis. *Calyx* alte 5-fidus ; segmenta lanceolata, margine serrata, reflexa. *Ovarium* glabrum. *Capsula* 3 mm. lata, 3-dyma, laevis.

South Africa. Coast Region : Bredasdorp Div. ; Riet Fontein Poort, near Elim, 30–60 m., *Bolus*, 8603 ; *Schlechter*, 9694.

XLI.—HOLLOW TREES.

W. J. Bean.

There is no doubt that hollow places in the trunks and limbs of trees formed by decay are better filled up. If the cavity be a large one the appearance of the trunk is thereby improved, and if it be small and properly treated decay is often arrested and new bark encouraged to grow over the filled up cavity. It prevents the entrance and accumulation of moisture, and thereby removes one of the chief predisposing conditions of decay.

The majority of such decayed hollows have their origin in snags left by branches broken off that have rotted back into the trunk because the new bark has not been able to grow over and seal up the wound. Branches removed by design, or broken off by wind or accident, should always be sawn off close to the trunk, and the sawn surface should then be coated over with ordinary coal tar. If a snag or stump is left the bark cannot grow over it ; damp, fungoid parasites and decay sooner or later follow and gradually find their their way towards and eventually into the trunk. Such is the most frequent beginning of cavities in the limbs and trunks of trees. The coating of tar renewed every two or three years, makes the wound watertight and fungus-proof ; its object being to serve as a temporary bark until a new natural covering is formed. It is certain that the life of many trees, historically famous or otherwise notable, might be much prolonged if a close watch against the intrusion of decay into the trunks and main branches was maintained.

With regard to hollows that have already formed the following treatment is recommended :—First clean out all the decayed material, especially the soft brown crumbling wood and the soppy

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mass frequently found at the bottom. Sound dead wood that has become dry and hard does not matter. Then wash the surface of the wood that is left exposed with a strong solution of carbolic acid. After allowing this a day or two to dry, a good thick coating of ordinary tar should be laid on. This antiseptic treatment is intended to destroy as far as possible fungoid parasites. It now remains to fill up the cavity. If this be a small one Portland cement may be used, and for round holes like those made by woodpeckers a plug of oak cut to fit will do. But if the hollow be a large one, like that shown in the illustration, the aid of the bricklayer may be obtained. After the bricks are laid the whole should be surfaced with cement. In the case of black trunks lampblack may be mixed with the outer layer of cement or it may be dusted over thickly with soot whilst wet. An intelligent workmen may be able also to imitate the characteristic corrugations or markings of the trunk.

These, however, are mere refinements. The chief points are, the keeping out of moisture and the provision of a surface over which the new bark may grow. If a tree is in a state of vigorous growth, as many hollow trees are, the bark will in time close over the "stopping." But unless some surface is provided on which the new wood can set itself it forms the thickened rolls seen in the beech tree of the picture. In very hollow trees open on one side a curious spiral growth of wood is sometimes seen in place of these thickened rolls which is due to the new wood continually being deposited on its own inner surface. A remarkable example of this curious growth is exhibited in No. IV. Museum at Kew, presented by Lord Iveagh. It is a section of elm trunk that was so hollow as to be merely a shell a few inches thick. On one side of the trunk was a longitudinal slit. The tree appears to have a good growth and to have made vigorous efforts to close up the opening, but having no surface on which to deposit the new wood and bark and thus bridge over the gap between the two lips, it eventually formed by its continual growth on the inner side two remarkable spirals suggesting a pair of scrolls.

XLII.—DECADES KEWENSES.

Plantarum Novarum in Herbario Horti Regii.

DECAS LXVI.

651. **Mahonia confusa**, *Sprague* [Berberidaceae]; affinis *M. Fortunei*, Fedde, a qua rhachi supra jugum supremum foliolorum producta, foliolis latioribus numerosioribus differt.

Planta circiter 1·2 m. alta. *Caulis* nitidulus, superne in sicco 5–6 mm. diametro; internodia superiora 0·8–1·3 cm. longa. *Folia* 26–40 cm. longa; petioli leviter vaginantes, 0·8–2·3 cm. longi; foliola 6–9-juga, lanceolata vel oblongo-lanceolata, longe acuminata, spinuloso-terminata, in inferiore $\frac{1}{3}$–$\frac{2}{5}$ versus basin angustata, integra, abhinc usque ad apicem grosse spinuloso-dentata dentibus utrinque 3–6; foliolum terminale 7·5–11 cm. longum, 1·5–3 cm. latum, basi 5-nervium nervis ad $\frac{2}{3}$ anastomosantibus; foliola lateralia intermedia

6–10 cm. longa, 1·5–2 cm. lata, basi trinervia ; foliola infima stipulis quam maxime approximata, circiter 3·5 cm. longa ; stipulae patentes, anguste subulatae, 0·8–1·5 cm. longae. *Racemi* 4–7, circiter 9 cm. longi ; bracteae cymbiformes, leviter deflexae, 3·5 mm. longae ; pedicelli circiter 2 mm. longi. *Sepala* exteriora circiter 2 mm. longa, media et interiora circiter 4·5 mm. longa, medio 5–7-nervia. *Petala* obovata, trinervia, 3·5 mm. longa. *Stamina* 2·5 mm. longa ; filamenta 1·5 mm. longa, edentula. *Ovula* 2, collateralia. *Bacca* caerulescenti-nigra, disperma, in sicco 7–8 mm. longa. *Semina* compresso-pyriformia, circiter 7 mm. longa. *Mahonia Fortunei*, Fedde in Engl. Jahrb. vol. xxxi. p. 130, quoad *Henry* 3117, non *Berberis Fortunei*, Lindl.

China. Hupeh : Ichang, *Henry*, 3117, 3351a. Western Hupeh, *Wilson*, 2680. Szechuan : Mt. Omi, *Wilson*, 3143.

Mahonia Fortunei, Fedde, has leaves with 3–6 pairs of narrow leaflets, the terminal leaflet being inserted between the uppermost pair. *Mahonia confusa* has 6–9 pairs of leaflets, and the terminal leaflet is separated from the uppermost pair by an internode of the rhachis. It is singular that the two species should have been confused, since the insertion of the terminal leaflet has been used in the key to the species given by Fedde in Engl. Jahrb. vol. xxxi. p. 79.

652. **Crotalaria** (**Calycinae**) **Meeboldii**, *Dunn* [Leguminosae-Genisteae] ; affinis *C. capitatae*, Benth., foliis oblongis basi rotundatis nec oblanceolatis basi cuneatis differt.

Herba perennis, 1·2 m. alta, rhizomate lignoso. *Caules* pauci, apice ramis brevibus florigeris muniti, inferne sub anthesi nudi, molliter (praesertim supra) hirsuti. *Folia* anguste oblongo-linearia, apice basique acuta vel obtusa, apiculata, 4–6 cm. longa, brevissime petiolata, margine paullo revoluta, integra, chartacea, supra praeter costam glabra, subtus et in margine pilis longis sparsis vestita ; stipulae lineares, deciduae. *Inflorescentia* 50 cm. longa, 6–8 cm. lata. *Racemi* densi, 3–4 cm. longi, in ramis 8–10 cm. longis basi paucifoliatis. *Flores* subsessiles, bracteolis linearibus. *Calyx* bilabiatus, extus dense et longe villosus, 1·3 cm. longus, lobis linearilanceolatis acutis tubo bis longioribus. *Corolla* caerulea, calyce vix longior ; vexilli lamina rotundata, basi squamis 2 deflexis instructa, apice extus parce sericea, ungue basi linea arcuata albo-tomentosa ornato ; alae oblongae, transverse rugosae ; petala carinae margine antica albo-tomentosa. *Ovarium* sessile, glabrum. *Legumen* calyci aequilongum.

India. Assam : Naga Hills ; Shibong, 900 m., *Meebold*, 7548.

653. **Begonia** (**Hydristyles**) **Cuninghamei**, *Sprague* [Begoniaceae] ; affinis *B. Bridgesii*, A. DC., a qua foliis majoribus longius petiolatis distinguitur.

Herba 5 dm. alta, radice fibroso. Caulis fere e basi ramosus, erectus, teres, laevis, glaber, inferne circiter 8 mm. diametro sordide rubellus, superne viridulus ; internodia 6–9 cm. longa. *Folia* oblique elliptico-ovata, sat abrupte acute acuminata, apice subrecurva, basi inaequaliter cordata, juniora utrinque praesertim supra nitida, supra impresso-punctata, adulta 12–16 cm. longa, 6·5–9·5 cm. lata, basi palmatim 10–11-nervia, margine leviter recurvo setuloso-serrulato, serrulis aliis apicem folii aliis basin folii spectantibus,

supra concava, opaca, viridia, nervis leviter impressis inconspicuis, subtus convexa nervis mesophylloque contiguo necnon venulis plus minus sanguineis, ceterum pallide viridia, subtiliter albido-punctata; petioli 3–7 cm. longi, nitiduli, leviter rubelli; stipulae oblongae, 2–3 cm. longae, apice rotundatae, apiculatae, basi truncatae postice plus minus cuspidatae, juventute postice circa caulem connatae, antice liberae, arcte imbricatae, membranaceae, pallide virides, nonnunquam leviter sanguineo-tinctae. *Cymae* unisexuales; pedunculus 8–12 cm. longus, glaber, rubellus; bracteae late ellipticae, circiter 7 mm. longae, inconspicue ciliatae vel denticulatae, membranaceae, caducae. *Flores* albi vel plus minus roseo-tincti. *Cymae* ♂ ter bifurcatae, deinde monochasiales. *Perianthii segmenta* 2, late ovata, basi subcordata, apice rotundata, circiter 1 cm. diametro. *Stamina* circiter 60, toro brevi insidentia; filamenta inaequalia, 1–2 mm. longa; antherae obovato-oblongae, 1–1·3 mm. longae, connectivo maximo apice rotundato loculos 0·2–0·4 mm. superante, loculis lateralibus 0·7–0·8 mm. longis. *Cymae* ♀ ter vel quater bifurcatae, deinde monochasiales. *Perianthii segmenta* 5, elliptico-oblonga vel ovato-elliptica, exteriora circiter 1·1 cm. longa, 7·5 mm. lata, interiora minora, intimum saepe minimum. *Ovarium* triloculare, trialatum, alis 2 subaequalibus cum ovarii lobis elliptico-oblongis, ala tertia majore cum ovarii lobo oblique ovata 1·3–1·7 cm. longa; placentae bipartitae, utrinque ovuliferae; styli 3 ima basi connati, 1 mm. supra basin bifidae vel trifidae, cruribus circiter 1 mm. supra basin in ramos stigmaticos spirales plus minusve inaequales bifidis, fasciis papillarum basi extra continuis.

S. AMERICA. Bolivia: on the slopes of the Andes, 14° 30′ S., 540 m. alt. Described from a living plant raised from seeds received in 1911 from Mr. H. Clinton Baker of Bayfordbury, Hertford. The seeds were collected by Mr. *L. Cuninghame*.

654. **Gentiana minuta**, *N. E. Brown* [Gentianaceae-Swertieae]; affinis *G. infelici*, Clarke, sed multo minor, floribus plus quam duplo brevioribus, corolla 5-loba.

Herba perennis, 1 cm. alta. *Rami* radiato-decumbentes, 1–2 cm. longi, glabri. *Folia* sessilia, omnia caulina, patula, 2–3 mm. longa, 1–1·5 mm. lata, lanceolata vel ovato-lanceolata, subobtusa, glabra. *Flores* solitarii, terminales, sessiles, 4·5 mm. longi. *Calyx* 5-lobus, glaber; tubus 2 mm. longus, 2·5 mm. diametro, campanulatus; lobi recurvi, 1–1·3 mm. longi et lati, ovati, acuti. *Corolla* cylindrico-campanulata, 5-loba, glabra, fauce squamis coronata; tubus 3 mm. longus; lobi 1·5 mm. longi et lati, suborbiculati, apice rotundati; squamae 1 mm. longae, lanceolatae, acutae.

INDIA. Himalaya: at Tunkra Pass, August, *Hooker fil.* and *Thomson*.

This is one of the smallest species of the genus, and was found mixed in moss with a species of *Sedum*.

655. **Polygonum (Cephalophilon) palmatum**, *Dunn* [Polygonaceae]; ab omnibus ceteris hujus sectionis foliis palmatis distincta.

Herba elata, robusta, caule terete striato ut ramulis petiolis venisque foliorum supra et subtus ut pedunculis bracteisque florum tomento sparso stellato et pilis strigosis vestito. *Folia* praeter suprema palmata, circumscriptione rotundata, cordata, dimidio vel

altius in lobos 5–7 incisa, ad 25 cm. longa, papyracea, lobis ovatis acuminatis basi contractis, sinubus rotundatis ; petioli foliis aequilongi vel longiores ; ocreae ovatae, acuminatae, laxae, eciliatae. *Racemi* capituliformes, globulares, 0·8–1 cm. longi, in ramis longis gracilibus paniculi terminalis instructi. *Flores* congesti, sub bractea quaque terni, 2–3 mm. longi, bracteolis 4 suffulti ; bracteae flores excedentes, lineares, basi paullo expansi, decurrentes sed non tubulares ; bracteolae ovatae, praeter cilias in margine paucas glabrae, floribus breviores. *Perianthium* 5-lobum, lobis lanceolatis tubo paullo brevioribus. *Stamina* 10, in tubo inserta. *Ovarium* ovale ; stigmata 3. *Nux* trigona, 2 mm. longa, perianthio persistente brevior.

India. Assam : Manipur ; Barak, 1200–1500 m. *Meebold*, 5730 ; Jhirighat, *Meebold*, 4790.

656. **Helicia Kingiana**, *Prain* [Proteaceae] ; species *H. robustae*, Wall., proxima, differt foliis margine integris squamis hypogynis in cupulam margine dentatam connatis, perianthioque crassiore.

Arbor 15–20-metralis, caule 3–4·5 dm. crasso, ramis patulis, ramulis crassis laevibus, fusco-cinereis vel fere atris summis distincte angulatis ; glaberrima. *Folia* sessilia vel subsessilia, coriacea, obovata vel elliptico-obovata, apice rotundata vel breve obtuse vel retuse acuminata, versus basin cuneatim attenuata, margine integra, 15–25 cm. longa, 6–11 cm. lata, supra pallide viridia, siccitate saturate olivacea, subtus siccitate purpureo-brunnea, utrinque opaca ; costa crassa utrinque elevata, nervi laterales utrinsecus 10–12 imis fere a basi obliquis, ceteris arcuatim ascendentibus, venae transversae prominulae irregulariter areolatae. *Racemi* crassiores, rigidi, sub quoque folio vel e nodis defoliatis singuli, ad 30 cm. longi ; pedunculi crassi 4–5 mm. longi pedicellos binos 4·5–6 mm. longos gerentes ; bracteae bracteolaeque minutae, erectae, caducae. *Peranthium* in alabastro 3·5–4 cm. longum, crassum, apice angulatum ; squamae hypogynae in cupulam margine minute dentatam 1–1·5 mm. longam connatae. *Stamina* filamentis latiusculis 2 mm. longis, connectivo lato, obtuse apiculato, antheris 3–3·5 mm. longis. *Ovarium* ovoideum, glabrum ; stylus stigmate clavato incluso perianthio aequilongus. *Fructus* globosus vel ovoideus, utrinque leviter attenuatus, unolateraliter obtuse carinatus, 3–4 cm. longus, 2–3 cm. latus, pericarpio laevi 2 mm. crasso. *Semen* drupa conforme, testa membranacea.

Malay Peninsula. Perak : Near Larut, 250–300 m., *King's Collector*, 3714, 3881, 3617. Gunong Batu Pateh, 1200 m., *Wray*, 983, 1160.

657. **Helicia rufescens**, *Prain* [Proteaceae] ; species nulli manifeste similis, ab *H. velutina*, Prain, quacum racemis pubescentibus congruit petiolis racemisque multo longioribus differt.

Arbor 18–24-metralis, caule 6 dm. crasso, ramis patulis, ramulis crassis fusco-cinereis summis rufo-tomentosis. *Folia* distincte petiolata, sub-coriacea, obovata vel late oblanceolata, apice acuminata, basi attenuata, margine integra, 15–30 cm. longa, 6–11 cm. lata, supra saturate viridia, siccitate saturate olivacea, juvenilia nervis costaque rufo-pubescentia mox glabra, subtus rubro-brunnescentia juvenilia dense rufo-pubescentia, utrinque opaca ;

costa utrinque elevata ; nervi laterales utrinsecus 16–20, inferiores approximati paralleli rectiusculi, superiores plus minusve distantes, arcuati ; venae transversae irregulariter areolatae ; petiolus 3–4 cm. longus, basi pulvinatus, dense rufo-pubescens. *Racemi* sub quoque folio vel e nodis defoliatis singuli vel bini, 15–20 cm. longi, dense rufo-pubescentes ; pedunculi breves, 1 mm. longi, pedicellos binos 2 mm. longos gerentes ; bracteae bracteolaeque ovatae, minutae. *Perianthium* in alabastro 1–1·2 cm. longum, lobi sub anthesin spiraliter torti, intus glabri ; squamae hypogynae liberae, obtusae, glabrae. *Stamina* filamentis gracilibus 1 mm. longis, connectivo obtuso apiculato, antheris linearibus 2·5–3 mm. longis. *Ovarium* dense rufo-villosum ; stylus stigmate cylindrico sulcato incluso perianthio aequilongus. *Fructus* subglobosus, utrinsecus parum complanatus, flavido-brunnescens utrinque acutatus, 3 cm. longus, 2·5 cm. latus, 1·5 cm. crassus, rufo-tomentosus, demum glabrescens, pericarpio 2–3 mm. crasso. *Semen* drupa conforme, testa membranacea.

Malay Peninsula. Perak : Larut and Thaiping, 150–450 m., *King's Collector*, 4213, 4939, 5096, 8604. Waterfall Hill and Tapai, *Wray*, 2083, 3084.

658. **Helicia velutina**, *Prain* [Proteaceae]; species nullo adhuc descripto apte comparanda ; ab *H. rufescenti*, Prain, quacum racemis pubescentibus congruit petiolis racemisque manifeste brevioribus differt.

Arbor 15–20-metralis caule 2·5–3·3 dm. crasso, ramulis crassis cinereis, striatis, summis minute cinereo-puberulis. *Folia* breve petiolata, chartacea, late oblanceolata, apice subabrupte acuminata, basi cuneata subdecurrentia, margine integra parum recurva, 10–20 cm. longa, 4–7 cm. lata, supra laete viridia, siccitate olivacea, subtus plumbea nisi costa parce pubescente glabra, utrinque nitidula ; costa utrinque prominula ; nervi laterales utrinsecus 14–16 supra impressi, subtus elevati recti, paralléles intra marginem anastomosantes ; venae irregulariter areolatae ; petiolus 1–1·5 cm. longus, basi pulvinatus. *Racemi* saepius e nodis annotinis singuli vel bini, 7 cm. longi, dense rufo-velutini ; flores dense congesti, in pedunculos perbreves vel glomeratim sessiles bini, ascendentes ; bracteae lineares, 7–8 mm. longae ; bracteolae lineares, 4–5 mm. longae. *Perianthium* in alabastro breve crasseque clavatum, 5 mm. longum, intus glabrum ; squamae hypogynae liberae, minutae, truncatae, glabrae. *Stamina* filamentis obsoletis, connectivo breve apiculato, antheris oblongis. *Ovarium* glabrum, ovoideum ; stylus crassus ; stigma clavatum. *Fructus* ignotus.

Malay Peninsula. Perak : Larut ; Gunong Bubu, 600–750 m., *King's Collector*, 7316.

659. **Philodendron Broadwayi**, *N. E. Brown* [Aroideae-Philodendreae]; affinis *P. Schottii*, C. Koch (*P. lingulati*, Schott, nec C. Koch), sed internodiis longioribus et foliis triplo vel quadruplo latioribus oblongis vel ellipticis facile distinguitur.

Caulis scandens, glaber, internodiis 7–13 cm. vel ultra longis. *Foliorum* petioli 7–15 cm. longi, longe vel usque ad apicem late vaginati ; laminae 8–30 cm. longae, 5·5–12·5 cm. latae, oblongae, ellipticae vel elliptico-ovatae, obtusae, breviter cuspidatae, basi rotundatae, utrinque glabrae ; nervi primarii utrinque 6–9,

patentes, leviter curvati. *Pedunculi* solitarii, 3–4 cm. longi. *Spatha* inaperta (immatura ?) 7 cm. longa, basi leviter ellipsoideo-inflata et 1–5 cm. crassa, glabra.

West Indies. Island of Tobago; climbing upon a shrub in a cool shaded place at Englishman's Bay, April 15, 1912. *W. E. Broadway*, 3880.

As the names *Philodendron Schottii*, C. Koch, and *P. lingulatum*, C. Koch, appear to have been overlooked by Engler and other authors, and are not included in the *Index Kewensis*, it may not be out of place to record their establishment here.

P. lingulatum, C. Koch, was published in "Appendix Gen. et Sp. quae in Hort. Bot. Berol. coluntur," 1855, p. 2, which may have been issued at the end of 1855 or early in 1856. The species was founded upon *Arum lingulatum*, Linn., as to the diagnosis of Linnaeus and Plumier's figure (t. 37), which he quotes, but not as to the other references given by Linnaeus, and is unmistakably described by C. Koch. The same plant was described by Schott in 1856 as *P. dispar*.

P. lingulatum, Schott, Synop. Aroid., p. 77, was founded upon a totally distinct plant from that which C. Koch had described as *P. lingulatum*, but was evidently published nearly at the same time, or possibly a little later, as the copy at Kew was sent to Sir Joseph Hooker by Schott on March 25th, 1856. C. Koch, however, appears to have considered that his *P. lingulatum* had the prior claim to recognition, since in Ender, "Index Aroidearum," pp. 61 and 63, he retains *P. lingulatum*, C. Koch, and assigns the date 1855 to it, whilst to the *P. lingulatum*, Schott (which was certainly not published until 1856), the name *P. Schottii*, C. Koch, is given. In a criticism of Ender's "Index Aroidearum," however, Schott in "Oesterr. Bot. Zeitschr.," 1865, p. 115, states that *P. lingulatum*, C. Koch, and *P. lingulatum*, Schott, are one and the same plant. It is quite inexplicable how Schott could have made this mistake, as the two species are entirely different, and were so regarded by Schott himself, both in his "Synopsis" and "Prodromus Aroidearum."

Linnaeus, according to his diagnosis of the species, evidently founded *Arum lingulatum* upon Plumier's figure, although he erroneously adds to it as a synonym a reference to another species figured by Sloane. As C. Koch also founded his *P. lingulatum* upon Plumier's plant, and his description of it was possibly published before that of Schott, it appears to me that his name should be retained by preference, the following being the synonomy of the two species :—

P. lingulatum, *C. Koch*, in Appendix Gen. et Sp. Nov. quae in Hort. Bot. Berol coluntur, 1855, p. 2. *P. dispar*, Schott, Synop. Aroid., p. 79 (1856), and Prod. Aroid., p. 233. *Arum lingulatum*, Linn., Sp. Pl. ed. 2, p. 1371. *Arum scandens, maximum, flore flavescente*, Plumier, Pl. Amer., vol. i, p. 26, t. 37.

P. Schottii, *C. Koch*, in Ender, Index Aroid., pp. 63 and 61 (1864). *P. lingulatum*, Schott, Synop. Aroid., p. 77, and Prodr. Aroid., p. 225. *Phyllitidi scandenti affinis minor (et major) graminifolia, &c.*, Sloane, Voy. Jamaica, vol. i, p. 75, t. 27, figs. 2–3.

660. **Xanthosoma cordifolium**, *N. E. Brown* [Aroideae-Colocasieae]; affinis *X. sagittaefolio*, Schott, sed foliis obtusissime rotundato-cordatis et spadice organis neutris clavatis carente longe differt.

Herba perennis. *Foliorum* petioli 4·5–6·5 dm. longi, ad apicem vaginato-canaliculati, virides, purpureo–brunneis marginati; lamina deflexa, 4·5–6 dm. longa, 3·5–4 dm. lata, cordato-ovata, acuta, lobis basalibus obtusissime rotundatis, marginibus undulatis, supra viridis, subtus pallidior; venae primariae utrinque 8–10, costae basales in sinu breviter denudatae, pluri-ramosae. *Pedunculus* 20–25 cm. longus, 1 cm. crassus, viridis. *Spathae* tubus 6–6·5 cm. longus, ellipsoideus, viridis, purpureo-marginatus; lamina 15–17 cm. longa, 7 cm. lata, oblonga, acuminata, basi subreflexa, superne adscendens, concava, pallide flavescens, purpureo-marginata. *Spadix* 15–16 cm. longus, parte feminea 2·5–3 cm. longa cylindrica pallide viridi, parte neutra 4–4·5 cm. longa, cylindrica superne breviter angustata pallide purpurascente, organis neutris infimis truncatis (nec clavatis), parte mascula 8–8·5 cm. longa cylindrica acuta alba.

British Guiana. Described from a living plant sent from British Guiana in 1898 to the Royal Botanic Gardens, Kew, where it flowered in July of 1900 and 1901.

Xanthosoma pilosum, C. Koch, and *X. Holtonianum*, Schott. These two species properly belong to the genus *Caladium*, and have been so transferred in the Botanical Magazine, under t. 8402, where, however, the name *Holtonianum* has (by a printer's error) been spelt *Hottonianum*. They should in future be known as :—

Caladium pilosum, *N. E. Brown* (*Xanthosoma pilosum*, C. Koch).

Caladium Holtonianum, *N. E. Brown* (*Xanthosoma Holtonianum*, Schott).

XLIII.—THE FULLER'S TEASEL.

(*Dipsacus Fullonum*, L.)

W. Dallimore.

Early in the present year a communication was received at Kew from Mr. George E. North, of Messrs. Wm. North and Sons, teasel merchants, Gelderd Road, Leeds, respecting the increasing difficulty of obtaining a regular supply of teasels of English growth, and asking whether it would be practicable to cultivate the plant under glass, or whether a better cultural method could be suggested than the one now practised, whereby it might be possible to grow the plant as a paying crop with more certainty than at present, and so check the serious falling off in the production of teasel heads which has occurred during late years.

Subsequently I was instructed by the Director to visit Mr. North for the purpose of discussing the past and present positions of the teasel business, with a view to formulating suggestions on the lines indicated above, and the results of that interview and of the enquiries made elsewhere are embodied in the following notes.

Teasels of commerce are the dry flower heads of *Dipsacus Fullonum*, L., gathered about the time when the seeds are fully

grown. The plant is a well-known biennial which is widely distributed in Europe, and is included in the British Flora. During the first year of its life a tuft of bright green leaves, which may be anywhere between 6 and 15 inches long, is formed, and the following year a central stem rises to a height of from 3 to 6 feet. This branches freely, and each division is terminated with a flower head. The flowers, which open during July and August, are regularly interspersed with strong, wiry, curved bracts, which, when dry, have considerable elasticity. The uniform development of these bracts and their subsequent ripening decides the value of the heads.

A great deal of difference is noticeable in the size of the heads borne by individual plants. The central one which terminates the main axis is always the largest, and is sometimes called a "king teasel." The next in size are found at the ends of the principal branches and are called "queens;" whilst minor branches bear smaller heads, which are distinguished as "princes" or "buttons."

As is well known, teasel heads have been used for many centuries by cloth-workers for raising a nap on cloth, and although inventors have tried for generations to construct a machine capable of giving the same finish, nothing has yet been found to equal the teasel. For use, the heads are arranged on a revolving cylinder, over which the newly-made cloth passes in the opposite direction to that in which the cylinder is turning. In passing, the teasel hooks tear up the surface of the cloth without in any way injuring the material, whereas steel or wire hooks often cause flaws. As a successful finish to cloth depends entirely on the regularity and evenness of the teasel hooks, it will be seen at once that damage through bad ripening, or other causes, adversely affects the monetary value of the crop. An idea of the nicety with which the heads have to be arranged for different classes of work may be gathered from the fact that Messrs. North sort them into 70 different sizes before distributing them to their customers.

Although several countries include the teasel amongst their agricultural crops, it is usually regarded as a minor one, and the areas under cultivation are restricted, therefore a shortage in any one country results in an all-round rise in price. France has, perhaps, the largest acreage, and French-grown heads have a higher reputation than those grown in other countries. In addition to England and France, teasels are grown in Germany and the United States.

According to Syme, "British Botany," ed. 3, vol. iv, p. 248, the culture and use of the teasel was introduced to England by foreign artisans about the reign of Richard I., and the plant has been grown regularly since the days of Edward III. The crop, however, has always been looked upon as a precarious one, and its culture has been in the hands of comparatively few people. Somersetshire, Gloucestershire and Wiltshire formed the principal seat of the teasel-growing business in the British Isles from its earliest days until the cloth-manufacturing centres were moved to the Yorkshire coalfield. About that time teasel-growers moved northwards also, and teasel-growing in Yorkshire has been carried on more or less successfully to the present day; a sequence of bad

seasons has, however, decided the majority of growers to give up the business. In Somersetshire, at the present time, according to information kindly furnished by Mr. Thos. F. Plowman, the cultivation appears to be nearly confined to Ashill Forest, West Somerset, where the soil is a stiff cold clay, and much of the working is done by spade labour.

An early account of teasel-growing in the British Isles is given in Johnson's edition of "Gerard's Herball or Generall Historie of Plantes," published in 1633. Two varieties are referred to, "tame" and "wild," the former corresponding with the Fuller's teasel of the present day.

In 1640 John Parkinson, in his "Theatrum Botanicum," refers to three kinds of teasels, "garden or manured," "wild," and "cut-leaved." According to present day nomenclature these may be referred to *D. Fullonum*, *D. sylvestris*, and *D. laciniatus* respectively. To the first named Parkinson refers in the following words: "The first is onely manured and sowen in gardens or fields for the clothmakers use, by raysing the wooll of cloth with the crooked prickles of the heads, make it fit for their sheeres to cut it smooth and thereby leave a fine nappe thereon pleasing to all."

Philip Miller, in the first edition of his "Gardeners' Dictionary," published in 1731, recommends that teasels should be grown alone. The practice had evidently been followed of growing a thin crop of corn with the plants for the first year, such as is done in some places at the present time. He gives the yield as 150 staves to the acre and the price as 1*s.* a stave.

The Rev. Wm. Hanbury, in vol. ii, p. 126, of his "Complete Body of Gardening," published in 1771, describes three kinds of teasels, "fullers," "jagged-leaved," and "small-leaved," and gives the method of cultivation adopted for the first-named. The salient points are as follows: Seeds were to be sown broadcast at the rate of one to one and a half pecks to the acre in March. When the young plants were large enough to be seen well, they were to be thinned out to from 12 to 18 inches apart each way, and the ground between hoed over. Several subsequent cleanings, and thinning if necessary, were recommended, and the heads were to be cut during the second August of the plant's life. A good crop tied in bundles was at that time worth 8*l.* an acre.

A good account of teasel-growing in England is given by Johnson and Sowerby in "Useful Plants of Great Britain," pp. 139–140. Teasel cultivation in France is dealt with in the "Journal of the Royal Society of Arts" for December 15th, 1911, pp. 128–129; and a good account of teasel culture in the United States may be found in "Bailey's Cyclopedia of American Agriculture," vol. ii, pp. 636–638.

The cultural methods adopted by Mr. North are as follows:—

Land is hired from farmers for the cultivation of one crop at the rate of 6*l.* per acre per year. Ground which will produce good wheat is considered most suitable for teasels, and, when possible, a crop of wheat is followed by teasels; the ground being well worked but not manured. Seeds are drilled into the ground in March of one year for the succeeding year's crop. In June the ground is

weeded, and any vacancies which may occur in the lines made up. In July the ground is again weeded and the plants are thinned out. In October a further cleaning of the ground and loosening of the surface soil takes place. Nothing more is done until March, when the ground is again loosened. At this time the plants are finally thinned, the stronger ones being left about three feet apart each way. Those taken out are used to fill up any gaps caused by death through damp or frost during winter. In May a final cleaning is given, and during the next two months a strict watch is kept in view of a possible attack by caterpillars. The harvest takes place during August and September. When the time approaches, sheds with open sides and thatched roofs are erected in the fields, and in these the heads are dried. As the heads mature at different periods, the plants have to be gone over several times. They are cut with about six inches of stalk and tied up in handsful. These are then threaded on long poles and hung in the sheds for about five weeks to dry. They are then taken into a barn, sorted and tied up into staves or bundles ready for sale. A bundle of heads varies considerably in price, the poorer ones being as low as 35*s.* and the best ones as high as 24*l.* Some factories use about three bundles a month, and Mr. North estimates the annual value of the heads used in this country at about 15,000*l.*

For comparison with the method of cultivation adopted in England the following extracts bearing upon the cultivation in France and the United States are taken from the above-mentioned articles. In France the plant is found to thrive best in a light, gravelly soil, with a southern aspect. The seeds are sown in spring and the young plants well thinned out. In August they are transplanted into rows about 12 to 15 inches apart, and are kept well weeded during winter. Sometimes they are sown in the places where they are to remain, and a cereal is sown with them, so that some return may be obtained from the ground during the first year. In the following spring, as soon as the plants have attained a height of from 20 to 24 inches, a number of the side shoots are removed, from eight to twelve being considered sufficient for each plant to carry. Harvesting is commenced when the leaves begin to fall or to turn yellow. When dry the heads are packed in boxes containing from 25 to 100 each, all of which must be of uniform size and colour. The principal teasel-growing districts in France are said to be Bouches-du-Rhone, Vaucluse, and Seine-et-Oise. In 1909, 3690 acres of teasels were grown in the three districts, and 40,380 cwts. of heads were produced which were valued at 51,237*l.*

Teasel cultivation in the United States appears to have commenced about 1840. At that time William Snook, a resident of Onondaga County, New York, paid a visit to his home in England and took back seeds. He afterwards imported teasel growers from England and established a small but important industry, which, according to the previously mentioned article, is still retained, although the industry has been kept within a radius of ten miles from the place where it was started. The "Diplomatic and Consular Report," No. 4148 (1907), however, refers to teasels being grown to a small extent in Clackamas County, Oregon. The cost of growing is there given as twopence a pound for dried heads

and the selling price as fourpence a pound. In America it is usual to sow the seeds in drills 3 to 3½ feet apart with a thin crop of corn. The corn is gathered and the straw left standing to afford some protection from snow during winter. The plants are eventually thinned to eight or ten inches apart in the rows and harvesting takes place in a similar manner to that adopted in England. The average crop is 100,000 heads to the acre (about the same as in England), and the price in New York State is from 90 cents to one dollar a thousand, although it may drop to 50 cents or rise to two dollars. One thousand heads are said to weigh ten pounds.

Regarding teasel culture in England there appear to be two critical periods. One is during winter when many plants are killed by inclement weather and the other is during the harvest when a period of wet weather may partially or wholly ruin the crop. On account of this Mr. North suggests indoor cultivation. In support of his suggestion he has grown a few plants indoors and produced heads which other experts pronounced to be equal in quality to the best French heads. On the other hand his experiment was not on a sufficiently large scale to be able to form an opinion as to the financial result. In the absence of experience one would be inclined to consider that such a scheme would be a financial failure for the gross average income from an acre of teasels is said to be about £70, and this after the ground has been occupied for 18 months, including two summers. An acre of glass built in the cheapest possible way would mean a considerable outlay; the soil would require to be renewed frequently, or additional expense would have to be incurred by building portable houses; wear and tear would be a heavy item; the plants would need more cultural attention than when grown outside and there would be a greater risk of injury by insect pests. The method of culture might, however, prove successful, but one would recommend caution and thorough work of an experimental character before an extensive scheme were undertaken.

There appears good reason to suppose that better results might be obtained by moving the cultural area from Yorkshire and the western counties to Essex and Hertfordshire and perhaps Norfolk and Suffolk. These counties have a drier winter and usually a sunnier summer and autumn, whilst there is plenty of suitable ground. It also seems that experiments might be conducted with a view to obtaining a race which would stand the winter well, for plants full of vigour in spring might be expected to mature earlier than those which had suffered in winter and by advancing the harvest by one or two weeks the crop might sometimes be saved. Experiments ought also to be made with a view to saving the ground for one summer. By sowing seeds thinly on a small area of ground, a crop of corn could be taken from the rest and the teasels planted out in autumn. What saving could be effected by this means, or whether there would be any saving, can, of course, only be determined by experiments. Efforts have been made to breed teasels yielding heads of particular sizes but without any definite results, and Mr. North finds from his experience that the best plan is to select seeds from well grown heads, then all the sizes can be obtained from the crop.

Should any farmer wish to experiment with the cultivation of teasels in the eastern counties, Mr. North has expressed his willingness to supply the necessary seed free of cost.

The following Return, showing the value of teasels imported into the United Kingdom from France, Germany, and the United States during the years 1910 and 1911, has been supplied by the Statistical Office of the Custom House, London.

Country whence consigned.	Year 1910.	Year 1911.
	£	£
France	4,987	8,681
Germany	110	295
United States	1,326	349

Briefly, the conclusions arrived at may be summarised as follows:—

According to the present outlook a steady demand for teasel heads is likely to continue, although it is doubtful whether there is much room for expansion in the world's production.

The cultivation of the teasel ought not to be allowed to drop in England, and experiments should be made with a view to finding the most suitable localities, the most economical method of culture, and a strain of plants which will winter well.

Farmers in the most suitable districts should be encouraged to undertake teasel-growing on a small scale, but it would be unwise for anyone to make it the sole, or even the principal crop, for although a well-gathered harvest of heads may be expected to result in good prices, so much depends on the weather at harvest time, that the crop must always be looked upon as risky.

Glass-house culture is worth a trial but it is probable that it will be found to be too expensive to be generally adopted.

XLIV.—MISCELLANEOUS NOTES.

Mr. Frank Birkinshaw, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Agricultural Superintendent in St. Vincent, West Indies.

W. R. Guilfoyle.—We regret to notice the death, on June 26th last, of Mr. W. R. Guilfoyle, for many years Director of the Melbourne Botanic Garden, Australia.

He was born in Chelsea, but went out to Australia early in life, and his first botanical appointment of importance was as botanist to H.M.S. Challenger, during her cruise among the South Sea Islands, in 1868.

In 1873 Mr. Guilfoyle succeeded the late Baron Ferdinand von Mueller as Director of the Melbourne Gardens, and it has been owing to his skill in landscape gardening that the gardens have attained their present beautiful condition.

Landscape gardening was his particular métier, and appears to have been an inherited faculty from his father, who laid out many important gardens in England and in Sydney.

During the thirty-six years of his Directorship, which he resigned in September, 1909, the changes in the garden were profound; lawns have replaced spaces formerly wilderness, vistas have been opened up which have given a great air of spaciousness to the grounds, and swamps have been transformed into lakes. In addition to his purely garden work the plant collections were enlarged to 14,000 species, and a special collection of Australian Acacias and Eucalypts was formed.

The garden, to which he was devoted and which owes so much to his skill and foresight, forms a lasting memorial to his work.

Guide to the Royal Botanic Gardens.—The "Official Guide" to the Royal Botanic Gardens has long been out of print, and to meet the need of some publication dealing with the collections of living plants a new guide entitled a "Popular Official Guide" has been prepared and recently published.

The guide consists of 104 pages of text with map and index. The map and key plan is taken from the latest survey and indicates the position of the more important collections. Wherever reference is made in the text to particular plants its approximate position on the map is indicated and can easily be found by means of the squares into which the map is divided.

The guide is divided into sections. Means of approach to the gardens and the general arrangement of the plants occupy the opening paragraphs, which are followed by a short Historic Notice of about twelve pages, in which the gradual development of the gardens is traced.

The collections are then described in some detail under the headings "Botanic Gardens," comprising the portions of the grounds near the main gate, "Glass Houses," "Museums," and "Arboretum." Owing to the extent of the gardens no particular route is suggested for visitors to follow, but as far as possible the plants of interest on different lawns are described in consecutive order, and cross references to similar plants in other parts of the gardens are given.

The glass houses are described in order of their numbers. In the portion devoted to the museums only the more important products of economic interest are mentioned, and as a rule only those of such plants as may be found among the collections of living plants. For fuller details the guides to the different museums should be consulted.

The Arboretum is described under four headings for the convenience of visitors. The first portion lies between the Kew Road and the Holly Walk, which contains especially the collection of *Leguminosae* and *Rosaceae*. The Pinetum, where the collection of Conifers is to be found, the Lake, and finally the portion of the Arboretum lying between the Sion Vista and the Thames.

Here are to be found the Oaks, Elms, Poplars, Birches, &c., as well as the Bamboo Garden, Azalea Garden and Rhododendron Dell.

Botanical Magazine for August.—The plants figured are *Hydrangea Sargentiana*, Rehder (t. 8447); *Aloe Steudneri*, Schweinf. (t. 8448); *Muehlenbeckia complexa*, Meisn. (t. 8449); *Pycnostachys Dawei*, N. E. Brown (t. 8450); and *Agave disceptata*, J. R. Drumm. (t. 8451).

The *Hydrangea* is one of the many new Chinese plants discovered by Mr. E. H. Wilson and sent by him to the Arnold Arboretum. This species is characterised by the conspicuous covering of bristly hairs present on its stems and petioles and is thereby easily distinguished from its nearest ally, *H. Rosthornii*, Diels. Though a native of Western Hupeh, at elevations of from 5,000 to 6,000 feet, several young plants at Kew, which were raised from seed presented by the Director of the Arnold Arboretum, were killed during the winter of 1909–10.

Aloe Steudneri is a particularly handsome species, with a dense rosette of leaves about 2 feet long, slightly branched peduncles 3 feet high, and pendulous flowers about 2 inches long, deep red, rose-pink, and dark yellow. It is a native of Eritrea and Abyssinia, and was first introduced into European gardens by Prof. Penzig of Genoa, who presented a plant to Kew in 1896. This has not yet flowered, the material for the figure having been received from the garden of Lady Hanbury at La Mortola.

Muehlenbechia complexa is a New Zealand species which was first received at Kew from the late Rev. W. Colenso in 1842, and is now often met with in gardens in the warmer parts of the British Islands. It has slender climbing stems which form dense masses when allowed to grow over shrubs or rocks, small leaves rather variable in shape, and flowers of which the perianth in fruit is accrescent and becomes glistening white. The figure was prepared from material obtained from Herm Island, Guernsey, by Mr. D. Hill, of Watford.

Pycnostachys Dawei is a handsome winter-flowering Labiate from Uganda, whence seeds were sent to Kew in 1905 by Mr. M. T. Dawe. Plants raised from these seeds flowered in January, 1906. It has now been figured from a specimen received for identification in December, 1911, from Dr. A. R. Wallace. The deep blue flowers, arranged in dense heads, are liable to injury at Kew from fogs.

The *Agave* was presented to Kew in 1893 by the late Mr. W. B. Kellock. It was received under the name of *A. Leopoldi*, Hort., and was believed by Mr. Kellock to be a hybrid between *A. filifera*, Salmdyck, and *A. princeps*, Hort. The plant has now flowered, and proves to be a valid species most closely allied to the group which includes *A. geminiflora*, Scannag., and *A. angustissima*, Engelm.

Botanical Magazine for September.—The plants figured are *Dendrobium Imthurnii*, Rolfe (t. 8452); *Columnea glabra*, Oerst. (t. 8453); *Berberis verruculosa*, Hemsl. & E. H. Wils. (t. 8454); *Chironia laxa*, Gilg (t. 8455); and *Primula Wattii*, King (t. 8456).

The *Dendrobium* is a distinct new species which was discovered in the island of Efate, one of the New Hebrides, by Sir Everard

im Thurn, who presented to Kew the plant from which the material for the figure was obtained. It is remarkable in its pseudobulbs, which are sometimes over four feet high. Its flowers are of medium size, white, with lilac marks on the lateral lobes of the labellum.

The handsome *Columnea* is a native of Costa Rica, where it appears to be one of the commonest species of the genus, and is found at elevations of from 5000 to 6000 feet. It is a true epiphyte, and has elliptic-oblong leaves 1–1¼ in. long, and scarlet hirsute corollas which when fully expanded are about 3 in. long. The figure was prepared from a plant acquired from Mr. Lemoine of Nancy in 1907.

Berberis verruculosa is a Chinese species discovered on the mountains around Tatien-lu in Western Szechuan by Mr. E. H. Wilson when collecting for Messrs. J. Veitch & Sons, who presented to the Kew collection the plant from which the specimen figured was procured. It appears to be very hardy, and forms a dense dwarf bush with stiffly arched branches and dark lustrous foliage. Its flowers are yellow and are rather large for a *Berberis*, and its oblong-ellipsoid berries are purplish-blue, about ½ in. long. The specific name has reference to the densely verruculose branches.

Chironia laxa is a pretty species of which a plant flowered last year in the Cambridge Botanic Gardens, where it had been raised from seed sent from Tembuland, Cape Colony, by Canon Mason. The material for the figure was received from Mr. Lynch. This species resembles in foliage the well-known *C. linoides*, Linn., but the pale magenta corollas have ovate-lanceolate subacuminate lobes.

Primula Wattii, a Sikkim species, belongs to the section *Soldanelloideae* which includes *P. Reidii*, Duthie, *P. soldanelloides*, Watt, and *P. uniflora*, Klatt. It has a scape about 4 in. high, bearing a dense head of violet flowers with a white mealy eye, and is distinguished from its allies by the bronze tint of its buds, the very wide calyx with irregularly toothed lobes, the rather large white mealy eye of the corolla, and the minute pistil. The drawing was made from a plant lent to Kew for the purpose by Messrs. R. Gill & Son, Falmouth.

Spices.*—In the Introduction to this recently published work Mr. Ridley very rightly observes "that the greater part of the spices that have been valued by man are derived from the Asiatic Tropics," and it would also be difficult to find a work of fiction or travel bearing upon the East that does not contain some reference to the subject. Mr. Ridley, from his long connection with the Eastern Tropics, writes with authority, and has produced a work of great value—not alone to the planter, but to those whose business lies on the commercial side of the question.

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* "Spices," by Henry N. Ridley, F.R.S , F.L.S., Director of Botanic Gardens. Straits Settlements. Macmillan & Co., 1912.

The historical notes are full of interest, and each subject is fully dealt with. Such matters as soils, cultivation, diseases, insecticides, fungicides, collection of the product and its preparation for commerce, being included.

The work runs into some 250 pages, and is well printed, but some of the illustrations are unworthy of inclusion. There is one omission, namely, that of the Caraway (*Carum Carvi*), which is largely produced in some European countries, and is most certainly an important spice; also, it is not conclusive that Corianders are not still produced in this country on a commercial scale.

J. M. H.

Sisal in Papua.—The following remarks from a sisal expert in Queensland, reporting on a visit to a plantation in Papua, have been sent to Kew by a correspondent:—

"Sisal in Queensland can for the present be counted out; labour is too uncontrollable, now too costly; added to which there is not enough labour in the country for the growing existing industries.

"The sisal position in Papua is as yet in the embryonic stage; there are several plantations with large areas, but at the present moment only a little over 2000 acres have been planted; how much more will be planted I am unable to say, as the country does not seem to be going ahead very rapidly. Climate, soil, and conditions are favourable, but though there is room for very great expansion, only certain limited areas of the country are suited to sisal-growing. These areas are all on or very near to the coast, in the dry zones, of which there are several in New Guinea; and as the climate in these zones is very good indeed, sisal-growing is a very good industry for Europeans to engage in in Papua. I do not think this kind of country is found in the German territory, and as yet the Dutch territory is practically unexploited and unknown. The known part of the British territory is for the most part very broken and mountainous, with rich soil on both the mountains, and in more or less narrow valleys."

Eucalyptus.—Mr. R. de Noter, of the Station Horticole d'Acclimatation, Bondy, Seine, has presented to the library a copy of a brochure published by Mr. A. Challamel, Rue Jacob, 17, Paris, comprising a series of articles on *Eucalyptus* which, during 1911 and the early months of the current year, he contributed to the Bulletin mensuel du Jardin Colonial et des Jardins d' Essai des Colonies (L'Agriculture pratique des pays chauds), Nos. 101–107, though no statement to the effect that the articles have appeared before is made in the brochure itself. The full title of the work is "Les *Eucalyptus* : Culture, Exploitation, Industrie, Propriétés médicinales". It consists of 119 octavo pages, with 37 figures mostly showing flowering and fruiting branchlets of certain species, and the price we understand is 5 francs.

The work is intended for the planter who, it is thought, in view of the fact that so much of the literature on the genus is scattered

through numerous publications, will find in it a volume easily accessible ; and as the author has spent ten years in cultivating and studying the many species which have been introduced into Algeria, where considerable success has rewarded the efforts put forth in establishing *Eucalyptus* plantations, his remarks as to the species which flourished or otherwise, and the cultural details which are supplied as the outcome of his own experience, should make his work of value to all who are interested in the planting of Eucalypts. Whether or not Mr. de Noter is aware of the excellent bulletins and circulars issued by the United States Department of Agriculture, and the Agricultural Experiment Station of the University of California does not appear. We refer to them below as to English-speaking people they specially appeal, for in them they have in their own language a valuable record of facts relating to the *Eucalyptus*, mainly as grown in the United States, which shonld be carefully considered by all who would venture on planting species of this important genus, concerning which, for commercial purposes, much experimental work, in selecting the most suitable species and the sites and climates best adapted for them, remains to be done.

Many allusions to the amelioration of the hygienic conditions of districts where the *Eucalyptus* has been planted are made by Mr. de Noter, and in this direction, we are inclined to think, he claims far too much for it, and in his enthusiasm overlooks some well-known facts which weigh heavily against his assertions. Much appears to have been done in Algeria in improving the climate of localities where malaria was often encountered, but whether the improvement has been effected entirely, or even partly, by the *Eucalyptus* planted there must be, in the presence of evidence on the subject before us, a matter of doubt. Mr. de Noter, however, seems to be quite satisfied as to what the plant has done, and is sanguine as to what it will do, in rendering malaria-stricken regions habitable and healthy to man. In Australia, he says, fever is unknown. It certainly should be if the *Eucalyptus* is performing the functions claimed for it by some writers. Yet Professor Liversidge, formerly of the University of Sydney, has drawn attention to the fact that for many years fevers have prevailed with great intensity in the *Eucalyptus* forests of their native land. With reference to the question of planting *Eucalyptus* in order to improve the hygienic conditions of certain localities, the article which appeared in the *Kew Bulletin*, 1903, pp. 1–10, should be consulted.

But, apart from this, the genus *Eucalyptus* is in many ways eminently important. For timber, tanning material, and oil, it becomes more and more valuable. Quite recently (*see* Nature, lxxxvi, p. 584), Mr. R. T. Baker, Curator of the Technological Museum, Sydney, who, in collaboration with Mr. H. G. Smith, published in 1902 an admirable account of the genus, dealing especially with its essential oils, informed Sir William Thiselton-Dyer that phellandrene oils—the term applied by chemists to oils which have been discarded owing to the adoption in Australia of the British Pharmacopoeia standard, which requires that all eucalyptus-oil offered for sale should contain not less than 50 per cent. of eucalyptol—for a time

regarded as almost useless, are now in great demand in mining operations. These phellandrene oils, which certain gum trees produce in greater quantities than other oils, yield the highest percentage of concentrates when employed on the "tailings" containing particles of minerals which in the past it has not been possible to extract profitably and satisfactorily. This discovery will, no doubt, add still greater importance to the genus as a source of oils.

We append the titles of the publications on *Eucalyptus* which, in addition to Mr. de Noter's work, are especially valuable to those who are interested in cultivating it on a commercial scale :—

1. **McClatchie, A. J.** Eucalypts cultivated in the United States. (U.S. Dept. Agric. Bureau of Forestry. Bulletin 35.) Washington (Government Printing Office), 1902. 106 pages and 91 plates. It includes a useful bibliography.

2. **Zon, R. & Briscoe, J. M.** Eucalypts in Florida. (U.S. Dept. Agric. Forest Service. Bulletin 87.) Washington, 1911. 47 pages and 5 plates.

3. **Ingham, N. D.** *Eucalyptus* in California. (Agric. Exper. Station, Berkeley, California. Bulletin 196.) Sacramento, 1908. 114 pages and 69 figures.

4. **Kinney, Abbot.** *Eucalyptus.* Los Angeles, California (Baumgardt & Co.), 1895. 298 + vi. pages and 29 plates.

S. A. S.

St. Vincent Agricultural Department.—We learn that the proposal brought forward by the Administration for the reorganisation of the Agricultural Department in St. Vincent has been passed by the Legislative Council.

Under the new Scheme which is to come into operation on October 1st, (1) The Agricultural Department is to be reorganised. (2) There is to be an alteration in the system of control of the Central Cotton Ginnery by which the Agricultural Superintendent is relieved of the work of supervision and the control is to be placed under the Superintendent of Crown Lands ; the Agricultural Superintendent, however, to be placed on the Advisory Committee of the Ginnery. (3) The system under which the Agricultural School is conducted is to be altered so as to bring it into line with that which obtains in Dominica and St. Lucia.

Other changes concerning the Grammar School, Girls Secondary School, &c., are to be carried out in consequence of the alteration with regard to the Agricultural School, which should result in greater efficiency in the educational system of the Colony.

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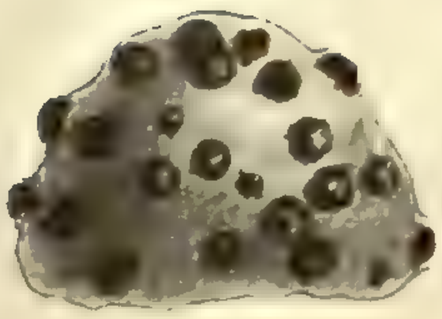
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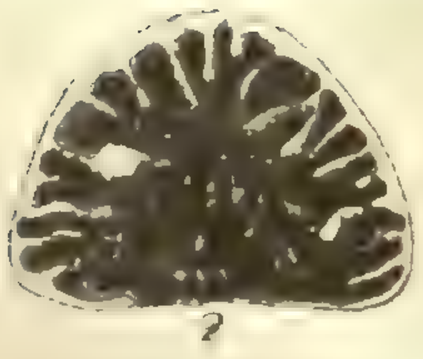
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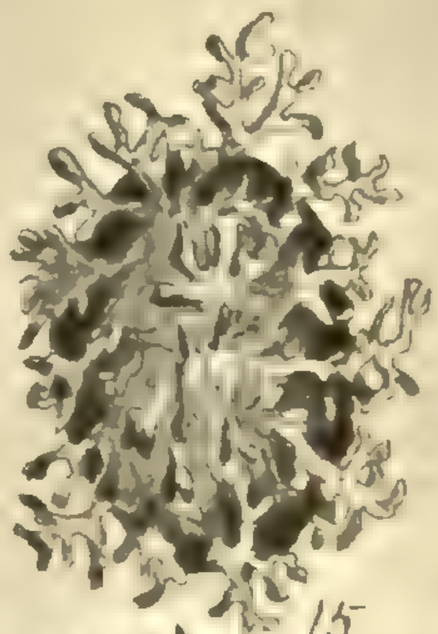
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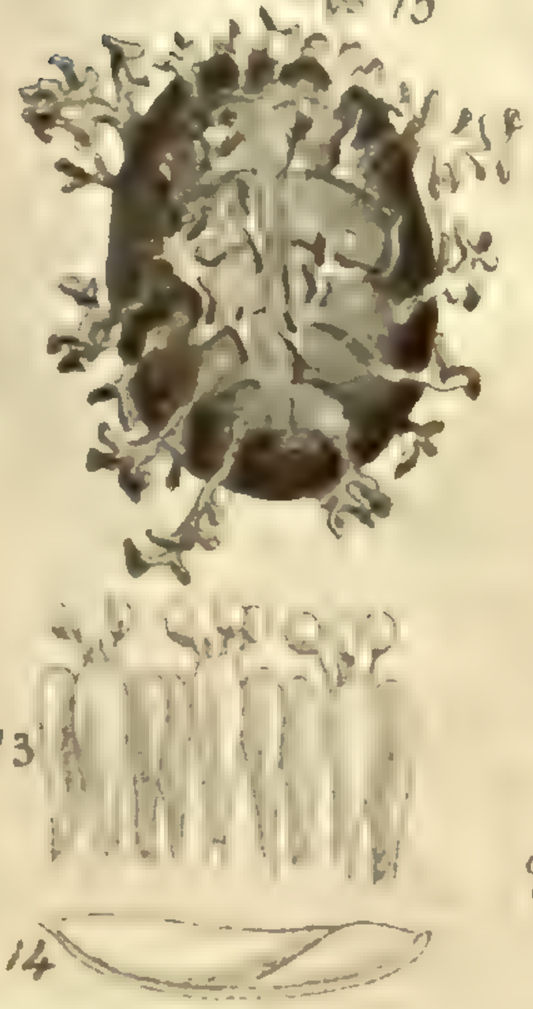
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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 8.] [1912.

XLV.—FUNGI EXOTICI: XV.

(With Plate.)

G. Massee.

Of the five new Fungi described, three have been received from the Gold Coast, West Africa, and two from Malaya. All are parasitic, but *Isaria Pattersonii* may be considered a beneficial parasite, since it attacks injurious scale insects. The other species are injurious parasites on economic plants.

Basidiomycetes.

Pleurotus Colae, *Massee* (figs. 11–14).

Pileus tenuissimus, primo resupinatus, dein lateraliter adnatus, sessilis, tenuiter membranaceus, candidus, puberulus, 3–4 mm. diametro. *Lamellae* paucae (7–12), distantes, tenues, acie integrae, concolores, apicem versus venoso-connexae. *Sporae* subglobosae, hyalinae, 7–8 × 5–6 μ. *Basidia* clavulata, hyalina, 28–34 × 6–7 μ.

Gold Coast. Aburi, on young fruits of *Cola acuminata*, Schott. & Endl., *W. H. Patterson*.

Gregarious on the pericarp. Quite a minute fungus, most nearly allied to *Pleurotus chioneus*, Pers.

Ascomycetes.

Dothidella Pterocarpi, *Massee* (figs. 5, 6, 9, 10).

Maculae hic inde sparsae, orbiculares vel difformes, determinatae, arescenti-fuscae, zona obscura cinctae. *Stromata* in centro macularum laxe aggregata, matrici innata, tumidula, atra, nitentia, subcarbonacea. *Asci* subcylindracei, apice incrassato-rotundati, basi modice attenuati, pedicellati, octospori. *Sporae* oblique monostichae, ellipsoideae, hyalinae, 1-septatae, 15–18 × 7–8 μ.

Malaya. Kuala Lumpur, on living leaves of the Angsana tree —*Pterocarpus indicus*, Willd., *C. K. Bancroft*.

This fungus closely resembles typical species of *Phyllachora* in its superficial characters, but differs in having hyaline, 1-septate spores. The stromata are blackish-brown and polished, resembling minute drops of pitch sprinkled on brownish patches on the leaves. The stromata are situated on the upper surface of the leaf.

(26431—6a.) Wt. 189—808. 1125. 10/12. D & S.

The Angsana tree, the host-plant, is grown as an avenue tree in several towns in the Malay Peninsula. As allied fungi cause early defoliation, the extension of the parasite should be checked, which could be accomplished by collecting and burning the fallen, diseased leaves. If spraying be practicable, half strength Bordeaux mixture should be applied when the foliage is young, independent of the appearance of the disease, in those districts where it has previously existed.

Deuteromycetes.

Diplodia Arecae, *Massee* (figs. 1–4).

Stromata tuberculoso-subhemisphaerica, 3–4 mm. diametro, erumpentia ac subsuperficialia, aterrima ; perithecia densiuscule gregaria, atra, irregulariter dehiscentia, contextu parenchymatico pellucido fuligineo. *Sporulae* ellipsoideae, utrinque obtusatae, rectae, 1-septatae, hyalinae, dein atrofuscae, 28–35 × 15–17 μ.

Gold Coast. Aburi ; parasitic on the seed of *Areca Catechu*, L., *A. E. Adams*.

The nuts, on arrival at Kew, appeared to be perfectly sound and free from disease, and were placed in a glass jar for exhibition purposes. After a period of some weeks, black pustules bursting through the testa were observed on some of the nuts, and in course of time, almost every nut became more or less thickly covered with prominent, black warts. In healthy seeds the endosperm is white, but in those that are infected it is converted into a blackish spongy mass. The endosperm is thoroughly permeated by the dark-coloured mycelium before the fruit of the fungus bursts through the testa. The appearance of the seed suggests that infection takes place at a very early stage of its development, probably through the stigma.

Technically *D. Arecae* is very close to *D. cacaoicola*, P. Henn., as originally described, but at the present time so many apparently different forms have been aggregated under the name *D. cacaoicola*, that *D. Arecae* may possibly be included amongst such, and if so, it is very important that the fungus on *Areca* should be diligently sought out and destroyed by burning, otherwise there is the probability of its passing on to other host-plants of economic importance, as the species of *Diplodia* are not so restricted in their choice of a host as are some parasitic species of fungi.

Isaria Pattersonii, *Massee* (figs. 15–17).

Stroma effusum, crustaceo-tomentellum, matricem totam externe atque interne ambiens, cinereum, ubique ramulos erectos multifidos emittens ; ramuli ex hyphis filiformibus densissime constipatis apice plus vel minus liberis efformati. *Conidia* in hypharum apicibus acrogena, numerosissima, globosa, hyalina, 2 μ diametro.

Gold Coast. Parasitic on a "scale insect"—*Nuzura viridula*, L., *W. H. Patterson*.

As a rule the insect is completely covered with a downy or minutely velvety nap, from which spring numerous, more or less erect, variously divided branches, bearing the very minute conidia at their fimbriate tips. The interior of the scale is completely filled with a white stroma formed of densely compacted hyphae. From analogy, this fungus must be considered as the conidial condition of a species of *Cordyceps*.

The scale insect is a giant of its kind, measuring about 1 cm. in length by 17 mm. in breadth.

Helminthosporium obovatum, *Massee*.

Maculae sparsae, orbiculares vel difformes, determinatae, fuscae. *Acervuli* hypophylli, in maculis laxe sparsi, olivacei, ex hyphis gracilibus rectis vel curvulis parce septatis compositi, 35–45 × 4–6 μ. *Conidia* obovata, utrinque obtusata, 1–3–septata, olivacea, episporio laevi donata.

Malaya. Kuala Lumpur, on living leaves of *Pterocarpus indicus*, Willd., *C. K. Bancroft*.

This fungus occurred on brown spots on the under surface of the leaf on which *Dothidella Pterocarpi* occurred on the upper surface, and may possibly prove to be a conidial condition of that species.

Explanation of Figures.

Fig. 1. *Diplodia Arecae*, fungus on Areca nut ; nat. size.
„ 2. Section of Areca nut, permeated throughout by the dark mycelium of the fungus ; nat. size.
„ 3. Section of a sound Areca nut ; nat. size.
„ 4. Spores of the fungus, showing various stages of development ; mag.
„ 5. *Dothidella Pterocarpi*, on leaf of *Pterocarpus indicus* ; nat. size.
„ 6. Portion of same ; slightly mag.
„ 8. *Helminthosporium obovatum*, on leaves of *Pterocarpus* ; mag.
„ 9. Section of leaf of *Pterocarpus*, showing *Dothidella* on the upper and *Helminthosporium* on the under surface.
„ 10. Ascus of *Dothidella* ; mag.
„ 11. *Pleurotus Colae*, on the Cola fruit ; nat. size.
„ 12. *P. Colae* ; mag.
„ 13. Basidia and spores of *P. Colae* ; mag.
„ 14. Section of *P. Colae* ; mag.
„ 15. *Isaria Pattersonii*, parasitic on *Nuzura viridula* ; mag.
„ 16. Portion of *I. Pattersonii* ; mag.
„ 17. Spores of *I. Pattersonii* ; mag.

XLVI.—DIAGNOSES AFRICANAE: LI.

1411. **Macphersonia acutifoliola**, *Hemsl.* [Sapindaceae-Sapindeae] ; inter species mihi cognitas gracilitate et foliolis apice aculeatis facile recognoscenda ; a *M. gracili*, O. Hoffm., racemis folia vix excedentibus recedit.

Frutex novellis pilosulis, ramis florigeris rectis rigidis. *Folia*, ut videtur, cum floribus in apicibus ramorum conferta, pari-bipinnata, rhachibus petiolisque pilosulis gracillimis ; pinnae 4–5-jugae, oppositae vel subalternae, approximatae, inaequales, inferiores breviores, longiores, usque ad 10 cm. longae ; foliola 5–20-juga, conferta, subsessilia, tenuia, primum ciliolata, ceterum glabra, supra nitida, oblique oblongo-lanceolata, 0·5–1·5 cm. longa, aculeato-apiculata, venis tenuissimis crebris inconspicuis. *Flores* polygami, masculi tantum visi, 2–3 mm. diametro, dense simpliciterque racemosi, pedicellis 2–3 mm. longis ; racemi axillares, 5–10 cm.

longi, bracteis minimis. *Sepala* 5 orbicularia, concava, 1·5–2 mm diametro, ciliata. *Petala* 5, squamiformia, circiter 1 mm. diametro, fimbriata. *Discus* annularis, glaber, coloratus. *Stamina* 7 vel 8, centralia, exserta, quam sepala duplo longiora ; filamenta filiformia, glabra ; antherae purpureae. *Ovarii* rudimentum nullum.

North Madagascar. Without exact locality, *Rev. R. Barron*, 6226.

1412. **Macphersonia myriantha**, *Hemsl.* [Sapindaceae-Sapindeae]; a speciebus ceteris differt foliorum amplitudine pinnis alternis et floribus numerosissimis paniculatis.

Arbor vel frutex praeter flores fere omnino glaber, ramis florigeris crassis primum obscure puberulis simul crebre lenticellatis ad nodos incrassatis. *Folia* alterna, bipinnata, ampla, usque ad 30 cm. longa, petiolo communi valido canaliculato ; pinnae alternae 7–11, saepius 10–15 cm. longae ; foliola usque ad 10-juga, brevissime petiolulata, subopposita vel superiora saepe distincte alterna, conferta sed non imbricata, leviter oblique oblongo-lanceolata, 2–3·5 cm. longa, obtusa, supra nitida, venis crebris inconspicuis. *Flores* perparvi, densissime cymosi, distincte pedicellati, pubescentes ; cymae racemosae vel racemoso-paniculatae ; paniculae usque ad 25 cm. longae et 15 cm. latae, sed saepe minores. *Sepala* 5, orbicularia, concava, 1–1·5 mm. lata. *Petala* 5, minutissima, fimbriata. *Stamina* bene evoluta non visa. *Ovarium* hirsutum. *Fructus* ignotus.

Madagascar. Without locality, *Perrillé*.

1413. **Landolphia (Jasminochyla) Rogersii**, *Stapf* [Apocynaceae-Plumerioideae]; affinis *L. Buchananii*, Stapf, sed partibus junioribus parce pilosulis, foliis lanceolatis, pedicellis ad 5 mm. longis, corollae tubo quam lobi longiore vel iis vix aequilongo, staminibus infra medium insertis distincta.

Frutex scandens ; rami juniores graciles, pilis brevibus patulis parce conspersi, cortice castaneo, lenticellis crebris pallidis parvis. *Folia* lanceolata, subacuminata, acumine obtuso, basi subrotundata, 5–8 cm. longa, 1·5–2·5 cm. lata, chartacea, supra fere opaca, prima juventate dorso in costa albo-pubescentia, mox glabrescentia, costa supra canaliculata infra prominente, nervis lateralibus utrinque 12–15 tenuibus rectis oblique patulis sub margine arcuatim connectis, venis infra prominulis supra subimmersis tenuissimis anastomosantibus ; petiolus 3–4 mm. longus, pilosulus. *Corymbi* parvuli, pauciflori, cum pedunculo 1 cm. longo parce pilosuli ; . bracteae oblongo-lanceolatae vel superiores ovatae, ad 2 mm. longae ; pedicelli ad 5 mm. longi. *Calyx* circiter 2 mm. longus, glaber vel parcissime et minute pilosulus, tubo brevi sed distincto, lobis ovatis obtusiusculis vel obtusis eciliatis. *Corolla* alba, glaberrima ; tubus subcylindricus, ad medium dilatatus, 7–8 mm. longus ; lobi lineari-oblongi, obtusi, ad 7 mm. longi. *Stamina* infra medium inserta. *Ovarium* ovoideum, glabrum ; stylus cum stigmate subcylindrico vix 2 mm. longus. *Fructus* ignotus.

Tropical Africa. Belgian Congo: Elisabethville ; Lat. 11° 37′ S., Long. 27° 24′ E., *Rev. F. A. Rogers*.

1414. **Lepidagathis Rogersii**, *Turrill* [Acanthaceae-Acanthoideae]; *L. anobryae*, Nees., affinis, sed foliis brevioribus facile distinguenda.

Caules erecti, teretes, glabri. *Folia* sessilia, oblonga, apice acuta, circiter 3 cm. longa, usque ad 2·5 mm. lata, trinervia. *Inflorescentiae* congestae, ex ima basi caulium nascentes; bracteae ovato-lanceolatae, apice acuminatae, 1·5 cm, longae, 6 mm. latae, steriles extra plusminusve glabrae, fertiles pubescentes, longe ciliatae; bracteolae lanceolatae, acuminatae, 1·5 cm. longae, 3 mm. latae, pubescentes, longe ciliatae. *Sepala* 5, ad basin libera, acuminata, pubescentia, ciliata; posticum lanceolatum, 1·8 cm. longum, 4 mm. latum; antica lanceolata, 1·5 cm. longa, 2·5 mm. lata; lateralia linearia, 1·4 cm. longa, 1·5 mm. lata. *Corollae* tubus cylindricus, 8 mm. longus, 1·5 mm. diametro, intra ad faucem sub staminum insertione annulo pilorum ornatus; limbus bilabiatus, extra pubescens; labium anticum trilobatum, 7 mm. longum, 1 cm. latum; labium posticum 6 mm. longum, 5 mm. latum, emarginatum. *Stamina* 4 ad corollae faucem inserta; filamenta 4 mm. longa, basi ciliata; antherae omnes biloculares; pollinis granula ellipsoidea, 40 μ longa, 30 μ lata. *Discus* cupuliformis, 1 mm. altus, ovarium cingens. *Ovarium* ovoideum, 2·5 mm. altum, 1·5 mm. diametro, glabrum, loculis uniovulatis; stylus 9 mm. longus, inferne longe pilosus.

Tropical Africa. Belgian Congo: Sakania, *Rev. F. A. Rogers*, 10,032.

1415. **Lepidagathis acicularis**, *Turrill* [Acanthaceae-Acanthoideae]; a speciebus omnibus africanis adhuc descriptis foliis acicularibus differt.

Caules tenues, teretes, glabri. *Folia* acicularia, apice acuta, sessilia, circiter 5 mm. longa, 0·5 mm. lata, subcoriacea, glabra. *Inflorescentiae* congestae, axillares vel basilares; bracteae lanceolatae, acuminatae, 1·7 cm. longae, 2·5 mm. latae, dorso fere glabrae, longe ciliatae; bracteolae bracteis similes. *Sepala* 5, ad basin libera, acuminata, dorso pubescentia, longe ciliata; posticum lanceolatum 1·7 cm. longum, 3 mm. latum; antica lanceolata, 1·7 cm. longa, 2·5 mm. lata; lateralia linearia, 1·5 cm. longa, 1 mm. lata. *Corollae* tubus inferne cylindricus, superne ampliatus, 1 cm. longus, basi 2·5 mm. diametro, apice 5 mm. diametro, intus ad faucem sub staminum insertione annulo pilorum ornatus, extra glaber; limbus bilabiatus, extra minute pubescens; labium anticum trilobatum, 6 mm. longum, 9 mm. latum, intra pilosum; labium posticum emarginatum, 5 mm. longum, 4 mm. latum. *Stamina* 4, ad faucem inserta; filamenta 4 mm. longa, glabra; antherae omnes biloculares; pollinis granula ellipsoidea, 40 μ longa, 25 μ diametro. *Discus* cupuliformis, 0·5 mm. altus, ovarium cingens. *Ovarium* late ovoideum, 1·5 mm. altum, 1·25 mm. diametro, loculis uniovulatis; stylus 1 cm. longus, minute glandulosus.

Tropical Africa. Northern Nigeria: Lokoja; on top of Mt. Patti, *Dalziel*, 139.

1416. **Thunbergia abyssinica**, *Turrill* [Acanthaceae-Acanthoideae]; species *T. sericeae*, Burkill, valde affinis, foliis oblongis, corollis majoribus, foliis bracteolisque rigide pubescentibus differt.

Caules erecti, teretes, dense pubescentes. *Folia* oblonga vel oblongo-elliptica, apice obtusa, basi rotundata, usque ad 3 cm. longa, 1 cm. lata, subcoriacea, pagina utraque rigide adpresse pubescentia, marginibus integra, trinervia, petiolis usque ad 2 mm. longis

suffulta. *Flores* axillares, solitarii, pedicellis usque ad 5 mm. longis suffulti ; bracteolae ovatae, apice obtusae, 1·5 cm. longae, 1 cm. latae, extra rigide pubescentes, intra glabrae. *Calyx* multifidus, 2·5 mm. altus, extra minute glandulosus. *Corollae* tubus cylindricus, superne ampliatus, inferne constrictus, 1·6 cm. longus, basi 3 mm. diametro, apice 6 mm. diametro, extra glaber, intus pilosus ; limbus aequaliter 5-lobatus, lobis 1 cm. longis 9 mm. latis, apice truncato-retusis, glaber. *Stamina* 4, filamentis minute glandulosis, antheris inferne barbatis ; duo antica filamentis 6 mm. longis, antherarum loculo utroque calcarato ; duo postica filamentis 4 mm. longis, antherarum loculis superioribus solum calcaratis ; pollinis granula sphaeroidea, 75 μ diametro. *Discus* 0·5 mm. altus, integer, ovarium cingens. *Ovarium* sub-sphaeroideum, 2 mm. altum, 2 mm. diametro, glabrum, 4-ovulatum ; stylus 9 mm. longus, glaber ; stigma bilobatum, lobo postico 2 mm. longo, lobo antico 1 mm. longo. *Capsula* 1·7 cm. longa, rostro 8 mm. longo, pubescens. *Semina* 4, complanata, laevia.

Tropical Africa. Abyssinia : between Dalbo and Kambata, April 1910, *N. C. Cockburn.*

1417. **Thunbergia lancifolia,** *Anders.*, in Journ. Linn. Soc. vol. vii. (1864), p. 19, var. **rhodesica,** *Turrill*, var. nov., a planta typica foliis ellipticis usque ad 3·5 cm. longis 1·7 cm. latis, caulibus foliisque moliter pubescentibus, bracteolis dense et minute glandulosis distinguenda.

Tropical Africa. Rhodesia ; between Broken Hill zincmine, and Bwana M'cuba copper mine, Oct. 1906, *C. E. F. Allen*, 298320 ; Broken Hill, Sept. 1909, *Rev. F. A. Rogers*, 8540.

1418. **Thunbergia Rogersii,** *Turrill* [Acanthaceae-Thunbergioideae] ; *T. angolensi*, S. Moore, affinis, caulibus patentim pubescentibus, foliis bracteolisque dense pubescentibus non tomentosis, bracteolis minoribus differt.

Caules erecti, teretes, patentim pubescentes. *Folia* elliptica vel ovato-elliptica, apice acuta vel leviter acuminata, basi rotundata, usque ad 2·7 cm. longa, 1·4 cm. lata, subcoriacea, pagina utraque adpresse pubescentia, marginibus integra, obscure penninervia, sessilia vel brevissime petiolata. *Flores* axillares, pedicellis usque ad 1·5 cm. longis patentim pubescentibus suffulti ; bracteolae ovatae vel elliptico-ovatae, usque ad 2·5 cm. longae, 1·2 cm. latae, extra pubescentes, intus glabrae. *Calyx* irregulariter lobatus, 2 mm. altus. *Corollae* tubus rectus, superne oblique ampliatus, extra minute glandulosus, intra inferne minute et dense glandulosus, superne glaber ; limbus glaber, 5-lobatus, lobis rotundatis posticis 8 mm. longis 1 cm. latis antico lateralibusque quam postici minoribus. *Stamina* 4, antheris apice distincte mucronatis inferne barbatis basi calcaribus vel minutissimis vel usque ad 1 mm. longis et curvatis instructis, filamentis inter se aequalibus, 1 cm. longis, glabris : pollinis granula sphaeroidea, 70 μ diametro. *Discus* crassus, 1·5 mm. altus. *Ovarium* 2·5 mm. altum, 2·5 mm. diametro, glabrum ; stylus (cum stigmate) 2 cm. longus, superne glandulosus ; stigma infundibuliforme, barbatum, glandulosum.

Tropical Africa. Belgian Congo : Elisabethville ; Lat. 11° 37′ S., Long. 27° 24′ E., 1476 m., *Rev. F. A. Rogers*, 10,150, 10,185.

1419. **Dalechampia Kirkii**, *Prain* [Euphorbiaceae-Crotoneae]; species *D. volubili*, E. Mey., quam maxime affinis foliis minoribus saepe 5-lobis stigmatibus dilatatis facillima distinguenda.

Suffrutex caulibus gracilibus volubilibus metralibus parce pubescentibus. *Folia* breve petiolata, firma, profunde 3-partita lobis lateralibus iterum inaequaliter 2-fidis raro integris; lobi lanceolati, acuti, margine argute serrati; lamina basi cordata, 2·5–4 cm. longa, 4–5 cm. lata, utrinque nitidula subtus prominenter reticulata, secus nervos minute pubescens; petiolus parce pubescens 8 mm. longus; stipulae lanceolatae, patentes, glabrae, 3 mm. longae. *Flores* capitati; capitula pedunculo parce pubescente 2·5–5 cm. longo suffulta; bracteae involucrantes lutescentes demum virides, 1·8 cm. longae, 2·5 cm. latae, basi alte cordatae, 3-fidae, lobi ovati, acuti, serrati; bracteae maris integrae; calyx maris extra minute puberulus, lobi ovati, acuti; calycis feminei segmenta lineari-lanceolata, utrinsecus dense pinnatim lacinulata; lacinulae graciles, glandulosae, scabridae; ovarium puberulum: stylus columnaris, cylindricus, apice ipso dilatatus. *Capsula* 3-cocca, pubescens, 8 mm. latus; cocci subglobosi. *Semina* globosa.

South Africa. Transvaal: Koomati Poort, *Kirk*, 60.

1420. **Drimia oligosperma**, *C. H. Wright* [Liliaceae-Scilleae]: *D. macranthae*, Baker, affinis, ovarii loculis biovulatis differt.

Bulbus ellipticus, 15 cm. longus, 6 cm. diametro, vestigiis fibrosis foliorum vestitus. *Folia* 12–14 rosulatim disposita, 45 cm. longa, 2 cm. lata, lineari-acuminata, glabra, dense tenuiterque venosa, linea media pallida 2 cm. lata instructa. *Pedunculus* 60 cm. longus, 1 cm. diametro, cylindricus, glaber; panicula 105 cm. alta; ramus infimus patens, 70 cm. longus; bracteae 12 cm. longae, e basi triangulari 8 mm. lata subulatae: bracteolae ovatae, 4 mm. longae; pedicelli subpatentes, 14 mm. longi, tenues, rigidi. *Perianthii* segmenta 2 cm. longa, 5 mm. lata, oblanceolata, obtusa, patentia, alba, nerviis 3 viridibus instructa. *Stamina* perianthii segmentis aequilonga; antherae 4 mm. longae, rubro-brunnae. *Ovarium* trilobatum, 6 mm. longum, loculis biovulatis; stylus brevis.

Native country unknown, probably South Africa; described from a plant cultivated in the Royal Botanic Gardens, Glasnevin.

Sir Frederick Moore writes "The inflorescences are much branched, over 6 ft. high. The flowers commence to open about 4 or 5 o'clock in the afternoon, and in the evening the inflorescence is covered with beautiful white stars." This plant was received at Glasnevin several years ago as "*Leucojum roseum*," with which it is totally unconnected.

XLVII.—ADINOBOTRYS OR WHITFORDIODENDRON.

S. T. Dunn.

When publishing the Indo-malayan genus *Adinobotrys* (*K.B.*, 1911, p. 193), the writer unfortunately failed to appreciate that the Philippine genus *Whitfordia* or *Whitfordiodendron*, as it was afterwards called (*Whitfordia* being pre-occupied by a fungus), published

by Mr. Elmer in his *Leaflets of Philippine Botany*, ii. 689 and 743 (1910), was a previous discovery of the same genus. Specimens were not available, and Mr. Elmer's suggestion of *Psoralea* as an ally and his description of the vexillary stamen as sterile seemed to indicate that his genus was systematically, as indeed his locality was geographically, far removed from *Adinobotrys*. Now that specimens have been received, however, from the Herbarium of the Philippine Bureau of Science through the kindness of Mr. Merrill, and have been compared with *Adinobotrys*, they are at once seen to be congeneric. The writer fails to see even the remotest special connection with *Psoralea* and finds the vexillary stamen to be constantly fertile. Its anther ripens and dehisces, like those of the other stamens, before the opening of the flower, but frequently becomes detached from its filament as the growing pistil pushes its way through the mass of slightly cohering anthers. With these explanations and apologies to Mr. Elmer for the oversight, the writer has now the pleasure of adding five more species to the interesting genus discovered by that energetic collector and botanist.

Those botanists who adhere strictly to the Vienna code of rules for nomenclature will prefer to retain the generic name *Adinobotrys*, as *Whitfordia* and *Whitfordiodendron* were not accompanied by a Latin description (in accordance with Article 36), and will refer to the Philippine species as *Adinobotrys scandens*, while those who admit vernacular diagnoses as conferring valid publication will call the genus *Whitfordiodendron* and the species *W. scandens*, Elmer, MS. (this combination has not been published before), *W. erianthum*, *W. filipes*, *W. Nieuwenhuisii*, *W. myrianthum*, *W. atropurpureum*. The following is the Latin diagnosis of Mr. Elmer's species.

Adinobotrys scandens, *Dunn* (comb. nov.); affinis *A. myriantho*, Dunn, sed floribus bis longioribus, et ovario uni-ovulato differt.

Frutex scandens. *Folia* 2-juga, 20–30 cm. longa; foliola superiora lateralia oblonga, acuta vel acuminata, basi cuneata, 10 cm. longa, coriacea, glabra, utrinque reticulata, venis 4–5-paribus, petiolulis 7–8 mm. longis, stipellis nullis. *Panicula* pseudo-terminalis, 30–50 cm. longa, ramis ad 10 cm. longis luteo-viridibus (*Elmer*) pubescentibus. *Flores* secus ramos dense subspicati, bracteis oblatis caducis. *Calyx* campanulatus, 5 mm. longus, lobis 4 tubo aequilongis, superiore bidentato, lateralibus acutis, inferiore obtuso, sicut pedicelli 1–2 mm. longi vexillum et carina breviter sericeo-tomentosus, bracteolis supra basin tubi affixis caducis. *Vexillum* intense rubrum (*Elmer*), basi rotundatum, exauriculatum, 1·7–1·8 cm. longum. *Alae* oblongae, basi antice semisagittatae. *Carina* similis. *Stamen* vexillare a caeteris liberum, saepe vexilli ungue plicato amplexum. *Ovarium* utrinque angustatum, medio uni-ovulatum, sericeum. *Legumen* maturum ignotum.

Philippine Islands. Is. of Sibuyan: Capiz Province; Magallanes (Mt. Giting-giting), *Elmer*, 12,259.

XLVIII.—THE GENUS CORCHOROPSIS.

H. Takeda.

This small genus, established on a single Japanese species, has been referred to *Tiliaceae* since the time of its publication.* When describing *Paradombeya*, a new genus of *Sterculiaceae*, Stapf, however, pointed out† that his genus had a close relationship to *Corchoropsis* and *Pentapetes*. It has therefore been suggested to me that it would be interesting to determine to what Natural Order the genus *Corchoropsis* should be referred.

The original description and figures given by Siebold and Zuccarini are excellent on the whole except for the stamens. The stamens are, normally, 15 in number, very slightly united at the base, arranged in groups of threes, which alternate with the five long narrowly spathulate staminodes placed opposite to the sepals. The middle one of each group of three stamens is the longest, whereas in *Paradombeya* it is the shortest. In anomalous cases, some of the stamens are lacking, so that there may be less than 15 of them. The petal is inequilateral, as in *Pentapetes* and *Paradombeya*. The design of the flower of *Corchoropsis* is therefore practically the same as in these two genera with this difference that the ovary is three-chambered and many-ovuled.

In external appearance *Corchoropsis* is very similar to *Corchorus*, as was noticed by Siebold and Zuccarini. The structure of the flower is, however, totally different from that tiliaceous genus in having a definite number of stamens and staminodes as well as in the nature of the petals, nor does it possess a close affinity to any other genus of *Tiliaceae*. I am consequently led to the conclusion that the genus in question is to be transferred to *Sterculiaceae*, tribe *Dombeyeae*.

The genus is only known from the Far East, and includes, at present, two species. The synonymy and distribution are as follows :—

Corchoropsis tomentosa, *Makino* in Tôkyô Bot. Mag. xvii. (1903), p. 11.—*Corchorus tomentosus*, Thunb. Fl. Japon. p. 228, excl. syn. *Corchoropsis crenata*, Sieb. et Zucc. in Abh. Akad. Miinch. iii., p. 738, tab. iv., 1 ; Miq. Prol. Fl. Japon. p. 206 ; Fr. et Sav. Enum. Pl. Japon. i., p. 66 ; Forbes et Hemsl. Index Fl. Sinensis, i., p. 94.

Japan, China, and Manchuria.

Corchoropsis psilocarpa, *Harms et Lösen.* in Engl. Bot. Jahrb. xxxiv., Beibl. 75, p. 51 (1904) ; Komar. Fl. Mansh. iii., p. 24 ; Nakai Fl. Koreana, i. p. 105, tab. ix.

Corea, China, and Manchuria.

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* Sieb. et Zucc. in Abh. Akad. Münch. iii, p. 737, tab. iv, 1. (1843).
† Stapf in Hook. Icon. Pl. ser. 4, viii, 1905, sub tab. 2743.

XLIX.—A CONTRIBUTION TO THE FLORA OF HAINAN (CHINA).

S. T. Dunn.

The flora of Hainan is as yet very imperfectly known and the few botanical collections that have been made there were almost entirely from the low lying regions in the north of the Island. Hance and Sampson* paid a short visit to Kiung-chou-fu in 1866 but collected only near that city, which is a few miles from the northern coast. In 1868 Sir Rutherford Alcock, then British Minister at Pekin, sent Swinhoe to investigate the commercial possibilities of the island and that energetic naturalist in the course of his enquiries penetrated as far into the interior as Ling-mun where the Li tribes come down from their southern fastnesses to barter with the Chinese of the northern plains. Fourteen years later B. C. Henry spent two months in exploring the interior and though he collected few plants we are fortunate in possessing an interesting description and map of his travels in his "Ling-nam" (Chap. xvii.–xxvii). His indefatigable namesake Augustine Henry, now Reader in Forestry at Cambridge University, collected a few hundred species around Hoihou the treaty port at the northern point of the coast, during his few months' residence there in 1889. Chinese collectors were also sent from Hongkong by Ford while Superintendent of the Botanical and Forestry Department in that Colony and the writer, his successor there, made many efforts to obtain collections from the interior and especially from the sacred Ng-shi-shan or five-finger mountain which lies rather to the south of the centre.

The island of Hainan is about two-thirds the size of Ireland and the central portion is covered with dense forest and is intensely hot and humid during most of the year. The forest is moreover infested with land leeches of a specially attentive kind. These obstacles would not however deter the Chinese collectors who have been sent. They have been prevented from reaching the central districts by their fear of the wild Li people who resent any intrusion by the Chinese into their country. B. C. Henry succeeded in reaching the neighbourhood of Ng-shi-shan but was unable to ascend it. In 1908 the Japanese collector Katsumata was engaged by the writer with the special object of collecting plants on Ng-shi-shan for the Hongkong Herbarium and the plants described or mentioned below are chiefly from his collection.

He described the mountain as densely clothed with forest nearly to the summit, where it rises into (probably five) bare and rugged peaks. The few other travellers who have been fortunate enough to see it on one of the rare occasions when it was not partly hidden by clouds corroborate this description.

Hedyotis paridifolia, *Dunn*, sp. nov. *Herba* praeter corollam glabra, 20–30 cm. alta. *Caulis* superne angulata. *Foliorum* duo paria sub floribus arcta, reliqua distantia, omnia subsessilia, elliptica, apice acuta, basi cuneata, 7–12 cm. longa, papyracea,

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* Bretschneider, History of European Botanical Discoveries in China, 635.

venis utrinque 7, paucis basin versus approximatis ascendentibus arcuatis areolarum series paucas includentibus ; stipulae parvae, late triangulares. *Flores* glomerulum terminalem sessilem 2–2·5 cm. latum foliis 4 floralibus suffultum formantes, albi ?, 8 mm. longi, sessiles, bracteis parvis ovatis suffulti. *Calycis* lobi 4, lineares, erecti, 2 mm. longi, tubo paullo longiores. *Corolla* infundibuliformis, lobis 4 linearibus tubo angusto bis brevioribus patulis, tubo intus fauce tomentello. *Stamina* 4, infra faucem inserta, corollam paullo excedentia. *Ovarium* biloculare, multi-ovulatum ; stylus filiformis, apice breviter 2-ramosus. *Fructus* ovoideus, crustaceus ; semina minuta, numerosa, angulata.

Ng-shi-shan, June, 1909, collected by *Katsumata*, *Hongkong Herb.*, 6649.

Comparable with *H. uncinella*, Hook. et Arn., but distinct in the cuneate base of the leaves and in the suppression of the upper internode whereby a whorl-like arrangement of four large leaves subtends the inflorescence as in *Paris*.

3554 **Hedyotis cryptantha**, *Dunn*, sp. nov. *Herba* perennis, procumbens, 30–40 cm. alta, praeter flores glabra ; caulis inter folia angulata, robusta. *Folia* primo caerulescentia, anthesi ex nodis paucis summis magna, erecta, approximata, flores obtegentia, ceteris ob bases tantum persistentes internodia brevia inferiora notantibus, elliptica, utrinque angustata, acuminata, basi dilatata, 20–30 cm. longa, papyracea, venis marginem approximantibus 6–7-paribus ; stipulae magnae, margines foliorum basi dilatatas jungentes, in lobum 1–2 cm. longum anguste triangularem dentatum expansae. *Flores* in glomerulos 2.5 cm. longos axillares collecti, albi, 2 cm. longi, subsessiles ; bracteolae lineari-lanceolatae. *Calyx* 1·5 cm. longus, lobis 4 linearibus tubo 6–8-plo longioribus. *Corolla* tubulosa, intus fauce tomentella, 1·7-1·8 cm. longa, lobis angustis tubo 6-plo brevioribus patentibus. *Antherae* in tubo infra tomentum inserta et eo sessiles. *Ovarium* ovale, 2 mm. longum, multi-ovulatum ; stylus tubo corollae aequilongus, bifidus. *Capsula* ovulis, membranacea, indehiscens ; semina minuta, angulata.

On level marshy ground near Hong-ta village, June 27th, 1893, *Hongkong Herb.*, 410.

Though differing in no way generically from *Hedyotis* this curious species is rather divergent in habit from any of that genus previously known from the region, having its clusters of white flowers almost hidden among the large leaves.

Ixora pavettaefolia, Craib.

Already known from Yunnan, Cochin China, and Siam.

3559 **Lasianthus calycinus**, *Dunn* sp. nov. *Arbor* parva vel frutex ; caulis primo adpresse sericeus, mox glaber. *Folia* oblongo-elliptica, breviter acuminata, basi rotundata, 13–15 cm. longa, chartacea, praeter venis tenuiter adpresse pubescentibus glabra, venis utrinque 8 infra prominentibus, trabeculis numerosis parallelis conspicuis ; petioli 0·8–1 cm. longi ; stipulae triangulares, acuminatae. *Flores* 4–6-ni, subsessiles, glomerulos axillares ebracteatos formantes, 7 mm. longi. *Calyx* 6 mm. longus, extus tenuiter pubescens, lobis 4 linearibus tubo breviter apice libero bis longioribus. *Corolla* tubulosa, extus sericea, intus infra faucem tomentosa, calyci aequilonga.

lobis 4 ovatis patulis tubo 4-plo longioribus. *Stamina* in tomento faucis inserta ex tubo paullo exserta. *Ovarium* ovatum; stylus tubo corollae equilongus, bifidus.

Ng-shi-shan, June, 1909, collected by *Katsumata*, *Hongkong Herb.*, 6643.

Nearest to the Burmese *L. Kurzii*, Hook. f., from which it is distinguishable by its nearly glabrous leaves.

1915 **Ardisia pachyphylla**, *Dunn*, sp. nov. *Arbor* omnino glabra. *Folia* oblanceolata, apice acuta, basi in petiolum attenuata, 8–9 cm. longa, coriacea, venis obscuris; petioli 0·8–1·2 cm. longi. *Flores* umbellati vel breviter racemosi in ramis inflorescentiae compactae terminalis 12 cm. latae; pedicelli 6–8 mm. longi. *Calyx* 5-fidus, 1–1·5 mm. longus, lobis ovatis glandulosis. *Corolla* eglandulosa, rotata, 0·9–1·0 cm. lata, fere ad faucem 5-fida, lobis ovatis aestivatione contortis. *Stamina* fauce inserta, antheris 3 mm. longis apiculatis filamento 6-plo longioribus. *Ovarium* globosum, stylo ante anthesin incluso, ovulis paucis biseriatis.

Ng-shi-shan, June, 1909, collected by *Katsumata*, *Hongkong Herb.*, 6680.

Allied to the North Indian *A. neriifolia*, Wall., but distinguished by its umbellate or nearly umbellate flowers.

Ervatamia pallida, Pierre ex Spire, Le Caoutchouc, 141.

The Hainan form has a glandular corolla and less caudate leaves. The species is rather widely dispersed in and about the same latitude in French Cochin China. It is said to yield a good caoutchouc (*Spire*, l.c. 180).

Callicarpa brevipes, Hance in Ann. Sci. Nat. sér. 5, v. 233.

Ng-shi-shan, June, 1909, collected by *Katsumata*.

Only known previously from the neighbourhood of Swatow and Hongkong, on the coast of Kwangtung.

L.—MISCELLANEOUS NOTES.

Mr. I. H. Burkill, M.A., Reporter on Economic Products to the Government of India, and Curator of the Industrial Section of the India Museum, Calcutta (*K. B.* 1899, p. 50; 1900, p. 16), has been appointed by the Secretary of State for the Colonies Director of the Botanic Gardens, Singapore, in succession to Mr. H. N. Ridley, M.A., C.M.G., F.R.S., retired.

Mr. George Henry Eady and Mr. Ernest William Morse, formerly members of the gardening staff of the Royal Botanic Gardens, have been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Curators in the Agricultural Department of the Gold Coast.

Mordecai Cubitt Cooke.—We record with regret the death of Mr. M. C. Cooke, for twelve years in charge of the Cryptogamic department of the Herbarium of the Royal Botanic Gardens. Cooke was born at Horning, in Norfolk. At the age of nine, he went to reside with an uncle at Ilford, and commenced the study of botany, being, as a child, first interested in flowering plants. His attention was soon attracted to fungi, at first from an edible standpoint, but soon, as Cooke himself often stated, the fungi exercised such a spell over his entire existence, that his interest in these plants ceased only when he peacefully passed away at his residence in Kentish Town on August 19th, a few days after his 87th birthday. Being dependent on his own resources from an early age, Cooke was, in turn, an assistant in a drapery establishment, teacher in a National school, and a lawyer's clerk. He afterwards obtained a more congenial appointment as assistant in the India Museum. On the abolition of this institution, Cooke spent some time at the South Kensington Museum, in the Mycological Department, and afterwards came to the Herbarium at the Royal Botanic Gardens, Kew, where he was also placed in charge of the mycological section. Cooke remained at Kew from 1880 to 1892, when he retired on pension. During this time Cooke incorporated his own herbarium, containing 46,000 specimens, with the existing collection at Kew as well as the collection of fungi presented to Kew by the Rev. M. J. Berkeley. Cooke's figures of fungi, mostly coloured, and numbering 25,000 plates, are also at Kew.

His first important work was the "Handbook of British Fungi," in two volumes, published in 1871, followed by "Mycographia," or coloured figures of fungi from all parts of the world, 113 plates; "Handbook of Australian Fungi," and "Illustrations of British Fungi," 1200 coloured plates. In addition to the above, over 300 articles on mycological subjects are credited to Cooke by Lindau and Sydow; for a period af 15 years, he also edited "Grevillea," a journal devoted to cryptogamic botany.

A pronounced feature of Cooke was his willingness to assist anyone interested in mycology; personally I may say that during an intimate acquaintance for over 30 years, I invariably received the fullest information on any subject that he was capable of affording, and cannot sufficiently express my indebtedness; this statement will, I am sure, be endorsed by many mycologists in various parts of the world.

G. M.

Botanical Magazine for October.—The plants figured are *Chamaedorea glaucifolia*, H. Wendl. (t. 8457); *Ceropegia Thorncroftii*, N. E. Brown (t. 8458); *Osmanthus Delavayi*, Franch. (t. 8459); *Elsholtzia Stauntoni*, Benth. (t. 8460); and *Furcrea elegans*, Tod. (t. 8461).

The *Chamaedorea* is an elegant species which has been in cultivation at Kew in the Aroid House for some 40 years. Last year flowers of both sexes were produced and yielded materials for the

illustration. *C. glaucifolia* has a slender stem with a graceful head of foliage. Its exact habitat is somewhat uncertain but it is probably in Guatemala. it was first described by Wendland in 1854 from a solitary plant in the Brussels Botanic Garden.

Ceropegia Thorncroftii was discovered near Barberton in the Transvaal by Mr. G. Thorncroft, by whom also it was introduced to European collections. From plants sent by him to the Cambridge Botanic Garden the material for the illustration was furnished in August, 1911. Its nearest ally is *C. crispata*, from which it differs in the much smaller flowers and the gibbous projection at the middle of the keel on the inner side of the lobes.

The late Abbé Delavay discovered the *Osmanthus*, which forms the subject of the next plate, in the mountains of Lankong in Yunnan, at about 9500 feet. The seed was originally sent to Mr. M. L. de Vilmorin. The plant figured, which was purchased from Messrs. Lemoine and flowered in March of this year, is one of the most pleasing of new evergreen shrubs. It resembles *O. suavis*, King, from Sikkim and Manipur, which, however, may be distinguished by its larger, more acute leaves, and its somewhat smaller lateral as well as terminal flowers.

Elsholtzia Stauntoni is probably the most useful of the 36 known species from the horticultural point of view. This species appears to be limited to the Province of Chihli, North China, and was introduced to cultivation by Mr. J. G. Jack, of the Arnold Arboretum. We are indebted to Prof. Sargent for the plant, presented to Kew in 1910, which has furnished material for the preparation of the plate.

To Lady Hanbury's garden at La Mortola, Ventimiglia, we are again indebted for material of the fine *Furcraea*, which, though long cultivated at Kew, has not yet flowered in the Succulent House. The plant is a native of Mexico and is allied both to *F. flavoviridis*, Hook., figured at t. 5163 of the Botanical Magazine and to *F. undulata*, Jacobi, also figured in the Magazine at t. 6160. The plant was first described by Todaro from a plant which flowered in the Palermo Botanic Garden in 1875, and is distinguished from all the other more or less stemless forms by the leaves which are nearly eight feet long.

Protium australasicum.—This tree was described in 1892 by Mr. F. M. Bailey, Colonial Botanist, Queensland, under the name *Bursera australasica* (Queensl. Dept. Agric., Bull. No. 18, p. 8), and the description was reproduced in his Queensland Flora, p. 223 (1899). Additional particulars regarding the flowers were given by Mr. Bailey in Proc. Roy. Soc. Queensl., vol. xi., p. 14 (1895). According to the classification of the Genera Plantarum, which was followed in the Queensland Flora, *B. australasica* comes under the genus *Bursera*.

In Engler's monograph of the *Burseraceae* (DC. Monogr. Phan. vol. iv., 1883, pp. 1–169), however, this genus was divided into *Bursera* (proper) and *Protium*, Burm.; and the segregation of these two genera has been accepted by botanists generally.

Using the key to the genera of *Burseraceae* given by Engler in Engl. and Prantl, Nat. Pflanz., vol. iii. 4, p. 234, *Bursera australasica* comes under division A.a. Petals valvate ; drupe indehiscent. The next subdivision is as follows :—

a. Drupe with 5–1 separate or contiguous but not united pyrenes.

β. Drupe with a 3–1-celled endocarp.

Now, *B. australasica* has a 4-ribbed endocarp composed of four extremely hard pyrenes which are united by rather softer tissue so that they may be forced asunder by a knife. It is, therefore, a little doubtful in which subdivision it should come. The only genera, however, with which its floral characters are consistent, are *Protium* in subdivision *a*, and *Canarium* in subdivision β. According to Engler, l.c. 234, 239, *Canarium* has vascular bundles in the pith, and as these are not present in *Bursera australasica*, this species is now transferred to the genus *Protium* as *P. australasicum*, Sprague (comb. nov.).

T. A. S.

Presentations to Museums.—The following miscellaneous specimens have been received in addition to those previously recorded in the Bulletin :—

Major Cyprian Bridge, Kingston-on-Thames.—Malformed branch of Douglas Fir from East Kootenay, British Columbia.

The Venble. H. H. Douglas Hamilton, Newmarket.—Fruit of Colocynth (*Citrullus Colocynthis*) from a tomb at Thebes.

Mr. M. D. Reece, Gold Coast.—Fasciated branch of Para Rubber Tree (*Hevea brasiliensis*).

Mr. W. Lock, Upwell, Norfolk.—Specimens of Tobacco grown in Norfolk.

Mr. J. D. Watson, M.I.C.E., Tyburn, Birmingham.—Two photographs of Bacteria beds at Minworth.

Mr. J. Medley Wood, Durban, Natal.—Section of wood of *Chrysophyllum viridifolium.*

Mr. H. A. Tempany, B.Sc., Antigua.—Specimens of Cotton Stainers and sample of Seed Cotton.

Mr. J. R. Drummond, Kew Gardens.—Specimens of wood and bark of *Boswellia serrata.*

Mr. R. B. Rogers, Launceston, Cornwall.—Photographs of *Cupressus Lawsoniana* injured by squirrels and rabbits.

Director of Agriculture, Southern Nigeria.—Fruits of *Thaumatococcus Daniellii.*

Japanese Horticultural Society of Tokyo.—Graphic of Statistics showing Japanese Horticultural Produce.

Marquess of Bute, Cardiff Castle, Glamorganshire.—Fourteen photographs illustrative of Forestry on the Estate.

Messrs. Thomas Wright & Son, Steam Mills, Chesham. A collection of various articles made from home-grown and foreign woods.

Messrs. Gale & Polden, Amen Corner, London, E.C.—Series of Photographs taken in the Royal Botanic Gardens, Kew.

Mr. J. M. Whistler, Upper Blackwood, Western Australia.—Photographs of Grass-gum trees (*Xanthorrhoea* spp.).

Messrs. A. & G. Paterson, Ltd., Banchory.—Planks of Douglas Fir, Larch, and *Abies nobilis*.

Mr. F. Du Cane Godman, London, S.W.—Section of wood of the old tree of *Dracaena Draco* of Teneriffe.

Rev. Canon Ellacombe, Bitton Vicarage, Bristol.—A collection of photographs of trees, &c.

Earl of Yarborough, Brocklesby Park, Lincolnshire.—Fifteen sections of burrs from home-grown trees.

Lt.-Col. J. J. Wood, Richmond, Surrey.—Painting of Flamboyant (*Poinciana regia*).

Mrs. Ward, Cambridge.—Portrait of the late Prof. Harry Marshall Ward, F.R.S.

Mr. H. J. Elwes, F.R.S., Colesborne, Gloucestershire.—Sections of Tree Fern stems, wood of *Diospyros Melanoxylon*, and basket made of leaves of *Alpinia nutans* by the Aborigines, Formosa.

Miss Wright, Kayhough, Kew Gardens.—Wood and herbarium specimen of *Ailanthus glandulosa*.

Messrs. W. T. Ellmore & Son, Ltd., London, E.C.—Examples of Willow basket-work.

Lt.-Col. Ratton, Blackheath.—A collection of drawings of fruit and fruit trees of the Malay States made by the late Surgeon-Major Ratton of the Madras Army. The drawings include Durian (*Durio Zibethinus*), Betel Nut (*Areca Catechu*), Jack Fruit (*Artocarpus integrifolia*), Bread Fruit (*Artocarpus incisa*).

J. M. H.

Forest Economic Products of India.*—This book, the outcome of a recommendation by the Committee of the Franco-British Exhibition of 1908, gives information regarding the various forest products of India. It is not a complete guide to all such products, but only to the more valuable and important.

After outlining the distribution and classification of the forest types the author discusses in detail eighty of the more common timber trees, giving the distribution, quality and uses of timber, value, and yield in various localities. Thereafter minor products such as cutch, gums, resins, fibres, &c., are dealt with.

For those interested commercially in the forest products of India this information should prove useful and for the convenience of those who may wish further information there are supplied the official designation and address of the officer to whom inquiries regarding each particular product should be directed.

A few reproductions of photographs of the commoner species and a map showing the general distribution of forests are added.

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* Commercial Guide to the Forest Economic Products of India, by R. S. Pearson, F.L.S., Economist at the Forest Research Institute, Dehra Dun.

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ROYAL BOTANIC GARDENS. KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 9.] [1912.

LI.—NEW SOURCES OF PAPER.

(*Hedychium coronarium*, Koen., and allies.)

(With Plates.)

Early in the present year Messrs. Clayton Beadle and Stevens, of London, drew the attention of Kew to the value of *Hedychium coronarium* as a source of material for paper-making.

This plant, a member of the Natural Order *Zingiberaceae*, is a native of India, being distributed from the Himalayas to Ceylon and Malacca, ascending to 4000 ft. in the Khasia Hills and 6000 ft. in Ceylon. It is also recorded from Central America, the West Indies, New Zealand, Mauritius and West Africa (Corisco Bay). Many years ago it appears to have been introduced into Brazil and it has run wild in many of the States, being especially abundant at Morrettes in the State of Parana, where it has covered a large tract of swampy country.

The plant in its naturalised condition in Brazil is shown on Plate I. When the introduction to Brazil took place is uncertain. There is a specimen at Kew collected by Dr. Glaziou in 1869 and the presence of the plant in Brazil is recorded by Martius* and K. Schumann.† These authors mention that the plant is known by the native names "Lagrimo de Moçá" and "Escaldamão." According to some Portuguese documents quoted by Messrs. Clayton Beadle and Stevens the plant is sometimes known in Brazil as wild Jasmine.

The genus *Hedychium*, of which a good description by Baker is to be found in Hooker's Flora of British India, vol. vi., p. 225, is characterised by the horizontal tuberous rootstock, which bears the erect elongated leafy stems. The leaves are distichous, oblong or lanceolate, with long clasping sheaths. The inflorescence forms a terminal spike.

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* Martius, Flor. Bras. III., iii., 37.

† K. Schumann, Pflanzenreich (Zingiberaceae), pp. 44 and 56. *See also* Usteri, Flora der Umbegung der Stadt São Paulo (1911), pp. 169, 170.

(26866—6a.) Wt. 189—806. 1125. 12/12. D & S.

H. coronarium is best distinguished from other species of the genus by the following characters :—Inflorescence ellipsoid or ovoid ; 3–5-flowered bracts which are densely imbricate in 5–8-spirals. Staminodia oblong-lanceolate, white. Labellum widely obcordate, white with yellow sometimes near the base. Filament white.

At Kew the plant thrives under tropical swamp conditions in House No. 15 and is an object of beauty throughout the summer and autumn with its spikes of fragrant white flowers. The photograph reproduced on Plate II. is taken from one of the Kew plants, and the numerous, closely-arranged leafy stems springing from the creeping rhizomes can be well seen. At Kew the stems attain a height of about 3–4 feet. In Brazil the plant is described as growing spontaneously and thickly and completely covering the land. The stems are said to reach a height of 1–1½ metres when growing thickly and to be about 2–4 cm. in thickness. On the margins of streams, however, the stems grow as high as 2 metres. After cutting down the stems it is found that some 4–5 months must elapse before a full growth of fresh stems is made.

In order to make certain of the identity of the Brazilian plant whose paper-making qualities had been tested, application for specimens was made to H.M. Consul at São Paulo for specimens of the plant. Thanks to the kind services of the Acting Consul and H.M. Vice-Consul at Curityba, a specimen of the plant known in that region as *Hedychium coronarium* has been received at Kew. This proved to be *Hedychium coronarium*, as did also the specimens sent to Kew by Messrs. Clayton Beadle and Stevens from Parana.

The value of the plant for paper-making was brought to our notice in a request for fresh material for the purpose of experimental investigation. Messrs. Beadle and Stevens had already satisfied themselves as to the good qualities of Hedychium fibre from the dried material they had received from Brazil, and were naturally anxious to test it in the green fresh condition. The paper-making qualities of the fresh material supplied from Kew were found to be identical with those of the dried stems, and the plant appears likely to be a very valuable source of material for the paper-maker.

In a letter to Kew, Messrs. Clayton Beadle and Stevens write:—

"Papers produced from this fibre have even greater tensile strength than the strongest manila papers produced. The strongest manila papers have a strength of 6000 or 7000 metres 'breaking length.' This paper has from 9000 to 10,000. Its elasticity and folding qualities are exceptional. Moreover, it can be made to bear ink and possess parchment qualities without any sizing or other special treatment.

"The reason of this we find to be due to the presence of the cells associated with the fibre, which are of a semi-gelatinous nature, when chemically treated, and dry into the interstices of the paper and produce natural parchment."

Messrs. Clayton Beadle and Stevens recently presented a paper to the Eighth International Congress of Applied Chemistry* on

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* The paper-making qualities of *Hedychium coronarium* represented from Original Contributions, Eighth International Congress of Applied Chemistry, vol. xiii , pp. 39–45.

I.—Hedychium Coronarium in Brazil.

[*To face page* 374.

II.—Hedychium Coronarium at Kew.

To face page 375]

the paper-making qualities of *Hedychium coronarium* and the following extracts are taken from a copy of the paper sent to Kew by the courtesy of the authors.

A chemical analysis of dried specimens as received was made with the following results :—

"A. Whole stem as gathered.
B. Whole stem after passing through crushing-rollers.

	A	*B*
Moisture	9·7%	11·2%
Ash	4·5	4·8
Cellulose	43·0	48·0
Extracted by chemical treatment	42·8	36·0
	100·0	100·0
Cellulose air dry on air dry allowing for losses	41·0%	44·0%

"Raw material in the form of B is conveniently treated by boiling with 5 per cent. of soda at a pressure of three to five atmospheres. On washing this material, the yield of boiled product including all the fibrous constituents of the plant is 60 per cent. The peculiar characteristics of the pulp are largely due to the presence of the oval cells of the pith, which is included in the above 60 per cent. If these are removed by washing, the yield of fibre proper is 50 per cent. of unbleached material on the raw weight.

"We discovered that the pith cells, which can be retained or not, according to requirements, possess very peculiar qualities. If taken alone, the unbleached cells when dried down go to a horny mass which can only be broken with very great difficulty with a hammer, and are softened only with difficulty when boiled in soda. If retained in the paper, they give it parchment-like properties to an extraordinary degree. They also render the paper ink-bearing without the addition of any sizing material. . . . . On the other hand, the paper made from *Hedychium* from which the cells are removed is of a soft nature and of medium strength, but that in which the cells are retained, as will be seen, gives higher 'breaking lengths' than any manila paper that we have so far had the opportunity of examining. The oval cells, therefore, 'parchmentize,' strengthen and size the sheet.

"The pulp, after boiling in soda and beating, if examined under the microscope in the presence of chloriodide of zinc shows :—

(*a*) Oval cells stained blue.
(*b*) Long wide fibres something like chemical wood, stained blue.
(*c*) Numerous shorter and solid-looking fibres, stained yellow.
(*d*) Small epidermal cells attached to one another, stained yellow."

The length of fibres is given in a table which is not reproduced here. The means of the results of measurements under the microscope of numerous fibres are as follows :—

"1. Hedychium fibres, unbleached, not beaten, 2·61 mm.
"2. Hedychium bleached, not beaten, 2·56 mm.

"3. Hedychium cells washed through 70-mesh wire, measured lengthwise, 0·138 mm.

"4. Hedychium cells washed through 70-mesh wire, measured crosswise, 0·083 mm.

"5. Best strong thick manila cable paper, 2·835 mm.

"6. Ditto, thin, 2·89 mm."

"It will be observed that the mean size of the cells, taking the mean of the two directions [mean of 3 and 4], is 0·11 mm., or less than 1/20 of the length of the fibres which measure 2·58. It can be understood, therefore, that such small particles as the oval cells will pass through a 70-mesh sieve of the washing drum, the holes of which would be about 0·2 mm., but the same sieve would of course retain the fibres proper. It will be observed also that the mean length of the fibres of the longest and strongest manila papers, which is about 2·85 mm., is only slightly in excess of that of the *Hedychium* fibre, but, as will hereafter be seen, the *Hedychium*, on account of the peculiar nature of the fibres and the cells, is capable of producing a stronger and in many respects more serviceable paper. Moreover, the smallness of the *Hedychium* cells in comparison with the fibres enables the cells to fill the interstices between the fibres. Moreover, these cells, being of a flocculent, sticky and glutinous nature, act as a natural sizing material. We mechanically separated and weighed the cells and fibres with the following results :—

"The actual amount of fibre proper and cells in *Hedychium* unbleached paper, the cells of which have been entirely retained, we find to be as follows :—

Cells	...	...	17·3%
Fibre	...	...	82·7

"When the pulp is completely bleached so as to produce a white paper, the proportion by weight of cells and fibres in the finished paper is as follows :—

Cells	...	...	14%
Fibre	...	...	86

"We have made several trials of this material on the paper machine. The beaten fibre, especially that containing the pith cells, when left in an unbleached condition, has an extremely greasy feel, enough to lead one to suppose that it would only part with its water with very great difficulty on the paper machine. Unlike most greasy feeling pulp, however, the water drains from the machine wire with great rapidity. We have seen the pulp on the wire of the paper machine on five or six occasions. In one case, when making a parchment paper, we observed that the water left the wire quickly after the apron—in fact, in one-quarter of the space taken by a wood-pulp paper made on the same machine at the same speed. This argues in favour of the possibility of comparatively fast running on the paper machine, in spite of the greasy feel and the parchment-like qualities.

"For the purpose of making a comparison of papers producible from the *H. coronarium* with papers with which it is likely to come into competition, we carried out a number of tests as to strength,

breaking strain, elongation, bursting strain and greaseproof qualities. These are contained in Table B [not reproduced].

"We draw attention to this fibre as we believe it may become of great industrial importance to the paper trade. Where circumstances are congenial to its growth, the plant spreads to the exclusion of all other vegetable growth by means of its rhizomes, so that it can be harvested at least once a year, producing a heavy crop. It is an easy pulp to manipulate. It is capable of producing a paper of exceptional strength and can be worked either bleached or unbleached. The fact that the paper in its natural state, without the addition of any materials whatever, can be made to possess greaseproof and self-sizing qualities is a point of commercial importance."

Messrs. Clayton Beadle and Stevens also inform us that they have dressed some of the fibre from the green stem, and the tensile strength tests indicate that it is almost exactly similar in strength to the best pure manila binder-twine. Samples both of the paper and the fibre have been presented to Kew and have been placed in the Museum.

Owing to the very remarkable paper-making qualities of *Hedychium* and the ease with which the plant spreads under favourable conditions in the tropics, it seems likely that it may be in considerable demand in the near future.

Amomum and Alpinia.

As *Hedychium* has proved to be so valuable a plant for paper-making, stems of *Amomum hemisphericum* and *Alpinia nutans* have also been submitted to Messrs. Clayton Beadle and Stevens for examination as to their paper-making qualities.

In the accompanying report they mention that in neither case do these plants yield papers showing the self-sizing qualities to be observed with *Hedychium* and under certain conditions also with manila waste, bagasse, and also with banana fibre. The Report is as follows :—

"These plants were passed through sugar-crushing rollers for the removal of juices and to reduce same to the condition of tow. They were then boiled under pressure, each with 20 per cent. of soda, the *Amomum hemisphericum* being boiled for 4 hours at 40 lbs. pressure and the *Alpinia nutans* for 6 hours at 50 lbs. They were afterwards bleached, and the yield of unbleached and bleached fibres expressed on the original green weight of stem as received, as follows :—

On green stem as received.		*Amomum.*	*Alpinia.*
Yield—unbleached	...	7·44%	5·93%
bleached	...	6·36	4·95

"If expressed upon the dry weight of stem the figures are as follows :—

On dry stem.		*Amomum.*	*Alpinia.*
Yield—unbleached	...	58·2%	50·0%
bleached	...	49·6	41·5

"The average length of unbeaten fibres as contained in each of the pulps taken as an average of 10 measurements was measured with the following results :—

	Amomum.	*Alpinia.*
Length of fibre	2·54 mm.	2·21 mm.

"From a superficial examination of the pulps in each case we think it possible that the *Amomum hemisphericum* could be made to produce a strong brown paper with a long tear. It is also capable of being bleached white. Very much the same remarks may be said to apply to the *Alpinia nutans*."

From Messrs. Clayton Beadle and Stevens' report it would appear that *Amomum* and *Alpinia*, though considerably inferior to *Hedychium*, might nevertheless be quite useful sources of material for the paper-maker. *Amomum hemisphericum* is a native of Java. *Alpinia nutans* is recorded from Hong Kong, Formosa, Cochin China, the Eastern Himalaya and the Malay Peninsula. It is also known from the West Indies, Guatemala, Venezuela, Surinam and Brazil, but like *Hedychium* it has probably been introduced into the Western Hemisphere.

Both *Amomum* and *Alpinia* belong to the Natural Order *Zingiberaceae*. Their habit of growth is quite similar to that of *Hedychium*, and it seems probable that *Alipinia* would form dense thickets in swampy country. The stems of *Amomum* reach a height of as much as 16 feet, and those of *Alpinia* are stated to attain to 8 to 10 feet in height.

LII.—AKANIACEAE: A NEW FAMILY OF SAPINDALES.

O. Stapf.

The position of the genus *Akania* has been much contested and no satisfactory suggestion has so far been made as to its proper place in the Natural System. *Akania* was described by J. D. Hooker in Bentham and Hooker's Genera Plantarum, vol. i. p. 409 (1862) and placed in *Sapindaceae* at the end of the suborder *Sapindeae* without any further observation. Bentham in Flora Australiensis, vol. i. p. 471 (1863) followed Hooker, adding that *Akania* was "allied to *Harpullia* but very different in the calyx and disk." This remark was probably occasioned by F. v. Mueller's suggestion that the plant which he had then just described as *Cupania lucens* (Fragm. Phyt. Austr. vol. iii. p. 44; 1862) may be a *Harpullia*. Baillon, in his Histoire des Plantes, vol. v. (1874) also has *Akania* in *Sapindaceae* "as the type of a small isolated subseries" and as a "perigynous Sapindacea" (p. 357), but as a doubtful member of the Order (p. 412). He had, however, not then seen the plant. When a few years later he received flowering material from the botanic garden at Hamma, Algeria, he pointed out that its relationship was with *Xanthoceras* which in his opinion connected the *Sapindaceae* with the *Staphyleaceae*. This met halfway F. v. Mueller's view, expressed in 1875, in the 76th fascicle of his Fragmenta Phytographiae Australiae,

(vol. ix, p. 90), that *Akania* was referable to the "*Staphyleae*" in spite of its alternate leaves and the absence of stipules. In 1890, Radlkofer discussed at some length the relationship of *Akania* in his paper "Gliederung der Sapindaceen" in Sitzungsber. d. k. Bayersch. Ak. d. Wiss. Band xx. p. 127–138, and pronounced for *Staphyleaceae*, but with this admission that the genus represented an anomalous type of that order, the anomaly being in the alternate estipulate leaves, the perigyny of the flowers, the diplostemony of the androecium, the pendulous, epitropous ovules and certain anatomical characters. Solereder in Berichte der Deutschen Botanischen Gesellschaft, Band x. (1892), p. 551, came to the same conclusion and established a tribe *Akanieae* of *Staphyleaceae* which apart from *Akania* also included *Huertea* and *Tapiscia*. His argument rests mainly on anatomical and seed characters; but even so the new tribe cannot be considered as sufficiently homogeneous. In fact, Pax in his monograph of the *Staphyleaceae* in Engler u. Prantl's Natürliche Pflanzenfamilien (Teil iii. Abt. 5. p. 259; 1893), while accepting *Tapiscia* and *Huertea* as the representatives of a distinct tribe (*Tapiscioideae*) of *Staphyleaceae*, felt obliged to reject *Akania* not only from that tribe but from the family, relying on the alternate arrangement of the leaves, the absence of stipules and especially the diplostemony of the androecium, the number of ovules in each cell and their pendulous, epitropous orientation.

Excluded by Radlkofer from *Sapindaceae* and by Pax from *Staphyleaceae*, *Akania* remained "incertae sedis" and was enumerated and described as such by Harms in Nachträge zum ii.–iv. Teil of the Natürliche Pflanzenfamilien (1897), p. 331. Solereder in his Systematische Anatomie der Dicotyledonen (1898), pp. 275, 276 (Engl. transl. 1908, pp. 242, 243), adheres to his view expressed in 1892, but without adducing new reasons or discussing the views put forward by Pax. Since then no further contribution on the subject has appeared. I myself examined the dried material at Kew some years ago without arriving at any result except the negative one that *Akania* agreed neither with *Sapindaceae* nor with *Staphyleaceae*.

The fact that in the present year a specimen of *Akania Hillii* flowered in the Temperate House at Kew and that the plant was selected for figuring in the Botanical Magazine induced me to take the matter up once more in order to see whether a place in the system could not be found for this stray genus.

The descriptions which we possess of the structure of *Akania* are neither in an exact agreement nor are they quite correct.

The original description by J. D. Hooker is erroneous in two points of importance, namely as to the character of the aestivation of the corolla and the number of the stamens. Hooker described the petals as imbricate, and this statement is repeated in Baillon, Histoire des Plantes (vol. v. p. 412) and in the Natürliche Pflanzenfamilien (Nachträge, p. 331). Baillon, however, in 1878 pointed out (in Bull. Soc. Linn. Paris, i. p. 224), that he found the corolla contorted in all the flowers he examined of the specimen which he received from Hamma, and this is also my experience from herbarium specimens as well as from the fresh material at Kew.

The number of stamens, varies from 8 to 9, but is usually 8, and I never observed 5 or 10. The gaps in the androecium are always in the inner whorl, but their positions are not constant.

The contorted aestivation adds to the characters which tend to exclude *Akania* from the *Sapindaceae* as well as from the *Staphyleaceae*. But if neither *Sapindaceae* nor *Staphyleaceae* are available to receive *Akania*, where is it to be placed? No other family has been suggested, and yet it is abundantly clear that the affinity lies with the *Sapindales*, Benth. and Hook. f. or *Sapindales-Sapindineae*, Engl., in which subseries it occupies an isolated position, comparable to that of the small families of the *Hippocastanaceae* and *Aceraceae*, although more detached than either. This means, to express the condition taxonomically, that *Akania* represents a distinct family in the subseries of the *Sapindineae*, the appropriate name for which would be *Akaniaceae* and its diagnosis as follows :—

Akaniaceae, *Stanf* (fam. nov.) ; ex affinitate *Sapindinearum*, a caeteris familiis subseriei distincta petalorum aestivatione contorta, disci absentia et endospermo amplo.

Flores hermaphroditi, actinomorphi, receptaculo magis minusve hemisphaerico haud alto. *Calyx* inferus, sepalis 5, eutopice imbricatis, secundo axin versus spectante, paulo inaequalibus. *Petala* 5, aequalia, dextrorsum vel sinistrorsum contorta, in receptaculi margine inserta. *Discus* nullus. *Stamina* fere semper 8 (raro 9), quorum 5 externa episepala in medio receptaculo, caetera vero circa ovarii basin inserta ; filamenta elongata, filiformia ; antherae oblongae, basifixae, basi breviter bilobae. *Ovarium* integrum, 3-loculare ; stylus simplex, rectus, filiformis ; stigma minute 3-lobum. Ovula in quoque loculo 2, superposita, anatropa, pendula, raphe adaxiali, micropyle supera, integumentis 2. *Fructus* capsularis, loculicide valvis 3 coriaceo-lignosis dehiscens. *Semina* exarillata, globoso-ovoidea, testa crustacea ; endospermum carnosum, amplum, cotyledonibus accumbens. *Embryo* amplus, rectus ; cotyledones transversae, crassae, subplanae ; radicula superior, brevissima, recta.

Arbores. *Folia* alterna, exstipulata, imparipinnata, coriacea. *Inflorescentiae* paniculatae.

LIII.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECADES LXVII.—LXIX.

4875

661. **Delphinium Purdomii**, *Craib* [Ranunculaceae-Helleboreae]; a *D. trichophora*, Franchet, cui affinis, petalorum lateralium lobis 5 mm. longis 1 mm. latis recedit.

Bracteae lanceolatae, acutae, 2·7 cm. longae, 6 mm. latae, supra fere glabrae, infra sparse villosae, longe ciliatae, 8 mm. infra apicem dente solitario latere utroque instructae ; bracteolae 2, 5 mm. inter se distantes, parte superiore pedicelli affixae, oblongo-lanceolatae, integrae, 1·4 cm. longae, 4 mm. latae, indumento ut bracteae ;

pedicelli erecti, rachidi adpressi, infimi 14 cm., intermedii 6·5 cm. longi, pilis albis divergentibus instructi. *Sepalum* posticum late ellipticum, acuminatum, 2·3 cm. longum, 2 cm. latum, intra glabrum, extra pilis longiusculis instructum; calcar rectum, 2 cm. longum, validiusculum; sepala lateralia 1·8 cm. longa, 1·2 cm. lata, indumento ut posticum sed praecipue medio marginibusque; infima 1·7 cm. longa, 1 cm. lata, indumento postici. *Petala* postica 3 cm. longa, apice bifida; lateralia apice biloba, lobis ad 5 mm. longis et 1 mm. latis barbatis. *Filamenta* summo apice glabra, paulo inferius pilis longiusculis divergentibus instructa, dein complanata, basi 1·25 mm. lata. *Ovaria* 3, villosa; stylus glaber, apice bifidus.

China. Kansu: Minchu, 2400 m., *Purdom*, 142, cult. Hort. Veitch.

662. **Tetracera Havilandii**, *Ridl.* [Dilleniaceae]; species *T. axillari*, Martelli, affinis, haud sericea autem atque foliis diversa, a *T. Radula*, Martelli, differt sepalis aequalibus marginibus exceptis glabris.

Frutex scandens. *Folia* obovata, apice rotundata vel emarginata, basi cuneata, in petiolum decurrentia, coriacea, 12 cm. longa, 7 cm. lata, scabrida, costa superne depressa hirta, capillis appressis; petioli breves, complanati, marginibus hirti. *Paniculae* parvae, ramis pilis stellatim patentibus munitis. *Sepala* sub fructu subaequalia, ovata, glabra, scabra, marginibus ciliatis. *Carpella* 3, ovata, apiculata, nitida, 3 cm. longa.

Sarawak. Kuching, Oct. 8, 1892, *Haviland*, in Herb. Kew.

663. **Tetracera scabricaulis**, *Ridl.* [Dilleniaceae]; species *T. Radula*, Martelli, proxima, sed caule insigniter scabrido, foliis oblongis obtusis basibus rotundatis, ramis paniculae pilis stellatis munitis differt.

Frutex scandens, caule validulo ligneo, primo scabrido, pilis brevibus rigidis mox pilis delapsis pustuloso-scabrido. *Folia* oblonga, obtusa, basi rotundata, apice, obtusa, 10 cm. longa, 4 cm. lata, marginibus inter apices nervorum sinuatis, coriacea, superne atque inferne scabra, nervis 7-jugis subtus elevatis, costa superne depressa, hirta (folia juvenilia superne hirta, pilis dissitis rigidis pallidis); petioli scabridi, complanati, atri, 5–6 mm. longi. *Paniculae* 10–14 cm. longae, basi ad medium nudae, ramis paucis brevibus scabridis hirtis, rachi pilis brevibus stellatis munito. *Flores* copiosi. *Bracteae* oblongae, obtusae, 5 mm. longae, pedicellos superantes, extus hirtae, marginibus dense ciliatis. *Sepala* exteriora ovata, orbicularia, rotundata, interiora magis oblonga, sericeo-pubescentia, marginibus ciliatis, subtus in centro sericea, 5 mm. longa, 3 mm. lata. *Petala* tenuia, glabra, paullo longiora. *Stamina* breviuscula, apicibus sub-obtriangularibus, saepe inaequilateralibus. *Styli* et carpella 3.

British North Borneo. Sandakan, *Creagh*.

664. **Talauma Beccarii**, *Ridl.* [Magnoliaceae]; species *T. Candollei*, Bl., affinis, foliis glabris, nervis numerosioribus petalisque longioribus et latioribus differt.

Frutex ramis pallidis, alabastris et apicibus ramorum hirtis, capillis flavis. *Folia* oblanceolata, cuspidata, 18 cm. longa, 5 cm. lata, glabra, coriacea, nervis 14-jugis, intra marginem arcuatis, reticulationibus in utroque latere conspicuis; petioli 2 cm. longi, ad basim

subito incrassati. *Petala* lata, oblonga, obtusa, apice rotundata, 4 cm. longa, 1·5 cm. lata. *Stamina* linearia, acuminata, acuta, 1·5 cm. longa. *Syncarpium* acuminatum, supra apices staminum serecio-lanuginosum, 3 cm. longum, 1 cm. latum, apicibus carpellorum glabris obtusis.

SARAWAK. *Beccari*, 3959.

Very distinct from what I take to be the true *T. Candollei*, Bl., in the narrower leaves more plainly reticulated, and the petals longer, and broader in proportion to their length.

665. Uvaria cauliflora, *Ridl.* [Anonaceae]; species sine dubio *U. purpureae*, Bl., affinis, differt toto coelo inflorescentia, quae paniculata est atque e caule lignoso exorta, foliis fere glabris et versus apicem latioribus versus basin attenuatis, calyce in flore expanso irregulariter disrupto.

Frutex scandens, partibus juvenilibus ferrugineo-tomentosis. *Folia* tenuiter coriacea, obovata, oblanceolata aut elliptica, apice saepe abrupte cuspidata, versus apicem latiora, ad basim obtusam attenuata, 13–24 cm. longa, 5–9 cm. lata, cuspide 1 cm. longo, nervis 13-jugis tenuibus, costa decidue ferrugineo-tomentosa, aliter glabra; petioli crassi, transversim rugosi, 5 mm. longi. *Flores* racemosi aut paniculati, ramis paniculae 5–12 cm. longis validis, rufo-tomentosis; bracteae persistentes, lanceolatae, obtusae, rigidae, rufo-tomentosae, 5–7 mm. longae. *Alabastra* ovoidea, 2 cm. longa, pedicellis bibracteatis 2–5 cm. longis. *Calyx* ovoideus rufo-tomentosus aut farinosus, irregulariter disruptus. *Petala* oblongo-ovata, extus farinosa, intus glabra, 7 mm. longa, 5 mm. lata. *Stamina* lineari-oblonga, 2 mm. longa, appendice complanato quadrangulari. *Torus* hemisphaericus. *Carpella* plura, truncata, stigmatibus brevibus. *Ovula* 6–9 in loculo.

SARAWAK. Tegora, *Haviland*, 417; foot of Bembang, *Haviland*, 409; *Beccari*, 1120.

The leaves of Beccari's specimen are smaller, more coriaceous and elliptic, but it resembles otherwise Dr. Haviland's fine series.

666. Uvaria lanuginosa, *Ridl.* [Anonaceae]; ab *U. parviflora*, Hook. f. et Thoms., foliis et ramis tomento aurantiaco-rufo tectis distincta.

Caules, folia, flores tomento aurantiaco rufo undique tecti. *Folia* elliptica, cuspidata, versus basin rotundatam attenuata, 14 cm. longa, 5 cm. lata, nervis 7–8-jugis intra marginem arcuatis; petioli 1·2 cm. longi. *Flores* parvi, "pallidi," in racemis extra-axillaribus; pedicelli 5 mm. longi; bracteae ovatae vel ovato-lanceolatae, obtusae, 5 mm. longae. *Sepala* ovata, obtusa, 5 mm. longa. *Petala* oblonga, obtusa, versus apicem dilatata, 1 cm. longa. *Stamina* breviuscula, oblonga, appendicibus majoribus. *Carpella* pauca, hirta. *Ovula* in seriebus 2, circiter 16.

SARAWAK. Near Kuching, *Haviland and Hose*, 334.

"Petals pale."

667. Artabotrys Havilandii, *Ridl.* [Anonaceae]; species *A. polygyno*, Miq. et *A. hamato*, Bl., affinis, floribus in unco complanato tomentoso majusculo, ramis pluribus brevibus; petalis lanceolatis hirtis, carpellis ovoideis breviter rostratis distincta.

Frutex scandens, ramis brunneis vel nigris longitudinaliter rugosis, partibus juvenilibus hirtis. *Folia* coriacea, adulta glabra, elliptica, acuminata, basi cuneata, in petiolum decurrentia, 12 cm. longa, 4 cm. lata vel minora, nervis 7-jugis in utroque latere elevatis gracilibus irregulariter anastomosantibus; petioli 1 cm. longi vel breviores. *Flores* in uncis validis complanatis (juvenilibus rufo-tomentosis) in ramis pluribus brevibus; bracteae ovatae, 2 mm. longae, rufo-tomentosae; pedicelli hirti, 0·5–1 cm. longi. *Sepala* ovata, triangularia, acuta, cuspidata, rufo-tomentosa. *Petala* lanceolata, obtusa, supra basim vix angustata, in utroque latere hirta, 1·5 cm. longa, 5 mm. lata; interiora angustiora. *Stamina* pauca, appendicibus majusculis rotundatis albescentibus. *Carpella* circiter 10, juvenilia clavata, rugosa, matura ovoidea, ad basim angustata, apicibus breviter rostratis, 2 cm. longa, 1 cm. lata.

Sarawak. Kuching, *Haviland*, 1629, 3340; *Beccari*, 381, 786, 713, 554.

668. **Artabotrys hirtipes**, *Ridl.* [Anonaceae]; species *A. hamato*, Bl., affinis, pedicellis bracteis sepalisque pilis rufis tectis foliis coriaceis glabris differt.

Frutex ramis nigris pilis brevibus rigidis tectis. *Folia* coriacea, glabra, elliptica, longe cuspidata (cuspide 1 cm. longo), basi paullo attenuata, 10 cm. longa, 3–5 cm. lata, nervorum 9-jugis ad apices arcuatis reticulationibus conspicuis, petiolis 6 mm. longis. *Flores* magni; pedicelli pilis rufis tecti, 1 cm. longi; bracteae ovatae, acuminatae, pilis longis rufis tectae. *Sepala* ovata, lanceolata, acuminata, 5 mm. longa, pilis rufis tecta. *Petala* externa lanceolata, obtusa, carinata, tomentosa, basibus paullo dilatata, supra excavationem haud angustata, 2·5 cm. longa, 1 cm. lata ubi latissima; petala interiora angustiora et breviora. *Stamina* pauca, glabra, appendicibus majoribus. *Carpella* subcuneiformia, apicibus latis complanata, 2 cm. lata, tomentosa.

Sarawak. Rejang Kapit, *Haviland*, 2326; Kuching, *Haviland*, 2106, in fruit.

The Kuching plant has more coriaceous leaves, 15 cm. long and 6 cm. across and stouter pedicels than the other specimen.

669. **Polyalthia coriacea**, *Ridl.* [Anonaceae]; arbor *P. congregatae*, King, affinis, sed foliis distincte petiolatis rigidioribus floribus minoribus breviter racemosis in trunco sitis.

Arbor parva. *Folia* coriacea, glabra, costa utroque latere et nervis subtus hirtis exceptis, elliptica, obtusa vel oblonga, breviter acuminata, 21–42 cm. longa, 10–16 cm. lata, basi late rotundata, nervis paribus 20 superne depressis subtus elevatis parallelis, nervulis transversis parallelis, petioli validi, 1 cm. longi dense hirti. *Flores* caulini in racemum brevem dispositi; pedunculus validulus, hirtus, 1 cm. longus vel minor; bracteae ovatae, omnes rufo-hirtae; pedicelli 2–3 cm. longi. *Sepala* triangularia, acuta vel acuminata, extus tomentosa, 6 mm.–2 cm. longa. *Petala* flava vel lactea, oblonga, obtusa, 4 cm. longa, 1 cm. lata. *Torus* semiovoideus, hirtus. *Pistilla* hirta. *Carpella* matura cylindrica, breviter rostrata pedicellata, velutinosa, 4 cm. longa, 2 cm. lata.

Sarawak. Mt. Buan, Limestone. *Haviland*, 2002; Bidi, *C. J. Brooks*, 1057.

Brooks' plant differs from Haviland's in its much larger leaves shortly acuminate at the tip, and larger distinctly acuminate sepals, but I have little doubt that they both belong to the same species.

670. **Polyalthia erianthia,** *Ridl.* [Anonaceae]; species affinis *P. oblongae*, King, floribus multo majoribus dense sericeo-lanuginosis, foliis ellipticis acuminatis majoribus subtus pubescentibus, nervorum paribus 9–10, nervulis parallelis differt.

Arbor, partibus juvenilibus lanuginoso-hirtis flavescentibus. *Folia* elliptica, acuminata, basi angustata, 20–30 cm. longa, 8–10 cm. lata, tenuiter coriacea, superne glabra, subtus minute pubescentia, nervis tenuibus superne inconspicuis subtus elevatis 9–10-jugis, nervulis parallelis, reticulationibus tenuibus; petioli crassi, pubescentes, 1 cm. longi. *Flores* singuli, axillares, omnino velutino-lanuginosi (staminibus exceptis), pedicellis crassis 7 mm. longis suffulti; bracteae ovatae. *Sepala* ovata, obtusa, 7 mm. longa. *Petala* externa ovata, lanceolata, obtusa, 2 cm. longa, 1 cm. lata; interna minora, angustiora. *Stamina* copiosa, appendicibus rotundatis. *Carpella* hirta.

Sarawak. Five miles from Kuching, *Haviland*, 410.

671. **Disepalum grandiflorum,** *Ridl.* [Anonaceae]; frutex *D. anomalo*, Hook. f., affinis, floribus majoribus petalis longioribus, internodio inter calycem et corollam distincto differt.

Frutex ramis pallidis. *Folia* elliptica, cuspidata vel ovata, basibus angustatis cuneata, 8–13 cm. longa, 5–5·2 cm. lata, tenuia, glabra, nervis gracillimis 8-jugis; petioli 5 mm. longi. *Flores* singuli, foliis summis oppositi; pedicelli ebracteati, graciles, 3 cm. longi. *Sepala* 2, ovata, obtusa, deflexa, 1 cm. longa, 8 mm. lata. *Corolla* 2 mm. supra calycem inserta; petala rufo-hirta, basi in cupulam connata, 2 cm. longa, 1 cm. lata; lobi 7 mm. longi. *Stamina* copiosa, appendicibus orbicularibus convexis.

Sarawak. Baram, *Hose*, 142; Marudi, *Hose*, 214.

672. **Unona jambosifolia,** *Ridl.* [Anonaceae]; frutex *U. Wrayi*, Hemsl., affinis, foliis magnis ellipticis basi cordatis subpeltatis fere sessilibus, nervis 10-jugis procul a marginibus arcuatim anastomosantibus, floribus binis, petalis crassiusculis subaequalibus ovato-lanceolatis, ovulis in ovario 1–4, seminibus 1-4 pro carpello.

Frutex. Folia subcoriacea, glabra, subtus pallida vel rufescentia, lanceolata vel elliptica, acuminata, basi rotundata vel cordata, subpeltata, 17 cm. longa, 5–7 cm. lata, nervis superne depressis 10-jugis 5 mm. a folii margine regulariter arcuatim anastomosantibus; petioli 2–4 mm. longi, crassi, hirti. *Flores* bini, in parte inferiore rami positi; pedicelli pubescentes, 1 cm. longi. *Sepala* semi-orbicularia, crassa, pubescentia, pilis rufis ciliata. *Petala* subaequalia, ovata, lanceolata, oblonga, 1 cm. longa, 6 mm. lata, crassiuscula, pilis rufescentibus marginalibus exceptis glabra. *Stamina* plurima, appendicibus latis complanatis angulatis. *Pistilla* hirta. *Carpella* matura circiter 14, globosa vel cylindrica, 10 cm. longa, 7 mm. lata, hirta, breviter rostrata, stipitibus 7 mm. longis. *Semina* 1–4.

British North Borneo. Batu Putik, *Creagh;* Kudat, *Fraser*.

673. **Unona conchyliata**, *Ridl.* [Anonaceae]; frutex *U. Wrayi*, Hemsl., affinis, petalis brevioribus et minoribus, obtusis, interioribus latioribus costatis, floribus in ligno vetusto singulis differt.

Frutex, cortice pallido. *Folia* elliptica, cuspidata, basi rotundata, 10–18 cm. longa, 4–5 cm. lata coriacea, glabra, nervis 9-jugis, nervis secundariis fere aeque conspicuis, reticulationibus in pagina utraque elevatis ; petioli crassi, transversim rugosi, 5 mm. longi. *Flores* in ligno vetusto singuli ; pedicelli 1 cm. longi, sub fructu incrassati. *Sepala* ovata, acuta vel obtusa, 1 mm. longa. *Petala* lanceolata, obtusa, 2·5 cm. longa, 6 mm. lata, pubescentia ; interiora latiora, costis elevatis e basi ad $\frac{1}{3}$ longitudinis currentibus. *Stamina* brevia, 5-seriata, appendicibus angulatis complanatis pallidis. *Styli* hirti. *Ovula* circiter 11 (ex *Haviland*). *Carpella* matura 4, ovoidea vel oblonga, 1·5 cm. longa, 1 cm. lata, stipitibus 6 mm. longis.

Sarawak. Kuching, *Haviland*, 1779.

"Petals at first pale then claret colour."

674. **Goniothalamus parallelovenius**, *Ridl.* [Anonaceae]; species *G. uvarioidi*, King, ut videtur affinis, foliis magnis oblongis iis *G. Curtisii*, King, similibus, floribus quam in *G. uvarioide* multo majoribus, petalis interioribus longioribus.

Folia magna, oblonga, basin versus paullo angustata, apice cuspidata, obtusa, basi rotundata, tenuia, coriacea, glabra, nervis 36-jugis parallelis subtus conspicue elevatis intra marginem arcuatis, costa convexa. *Flores* magni ; pedicelli validuli, 2·5 cm. longi. *Sepala* coriacea, triangularia, obtusa, 6 cm. longa, basi 5 mm. lata. *Petala* exteriora coriacea, anguste lanceolata, acuminata, obtusa, 6·5 cm. longa, 1 cm. lata, basi dilatata 5 mm. longa, minute farinoso-hirta ; petala interiora late lanceolata, basi angustata, obtusa, 4 cm. longa, 1·2 cm. lata. *Stamina* angustata, linearia, 3 mm. longa, appendicibus angustis conicis erectis scabris.

Sarawak. *Beccari*, 3772.

I have only seen a single flower and leaf of this species, but it seems very distinct from any other.

675. **Mitrephora rufescens**, *Ridl.* [Anonaceae]; arbor parva rufo-hirta, *M. longipetalae*, Miq., e descriptione affinis, petalis autem multo minoribus exterioribus ovatis interioribus ungue lineari apice reniformi, nec ut in *M. longipetala* lineari-lanceolato et pollice parum longiore.

Arbor parva, circiter 5 m. alta, ramis petiolis nervis et partibus juvenilibus rufo-hirtis. *Folia* elliptica ad lanceolata, acuminata, basi rotundata vel breviter cuneata, 16–20 cm. longa, 5–8 cm. lata, tenuiter coriacea, superne in statu adulto glabra ; petioli 5–8 mm. longi. *Flores* in racemos rufo-hirtos perbreves dispositi ; singulatim aperti ; bracteae ovatae, persistentes. *Sepala* ovata, acuta, rufo-hirta. *Petala* exteriora ovata, acuta, 1 cm. longa, 5 mm. lata, extus sericea, intus glabra ; interiora ungue lineari, apice dilatato reniformi, extus pubescentia, limbo intus sericeo. *Stamina* copiosa, glabra, appendicibus semiglobosis rotundatis.

Sarawak. *Beccari*, 1616 ; Matang, *Haviland*, 1035 ; Bau, on limestone, *Haviland*, 2249.

Sumatra. Sungei Buluk Padang, *Beccari*, 916, 968.

676. **Oxymitra linderifolia**, *Ridl.* [Anonaceae]; frutex glaber, *O. glaucae*, Hook. f. et Thoms., affinis, foliis coriaceis, nervis pauciori-bus, petalis latioribus differt.

Frutex glaber. *Folia* coriacea, superne brevia, subtus glauca, elliptica, cuspidata, acuta, basi rotundata aut breviter cuneata, 15–18 cm. longa, 6–8 cm. lata nervis 6-jugis subtus elevatis, costa convexa superne depressa; petioli 1·1 cm. longi. *Flores* singuli, in pedicellis extra-axillaribus 1 cm. longis; bractea mediana, brevis, lanceolata. *Sepala* pugioniformia, basi lata, apice angustata, 4 mm. longa. *Petala* exteriora lanceolata, linearia, pubescentia, 9 mm. longa, 3½ mm. lata; petala interiora conum angustum formantia, 5 mm. longa. *Torus* minimus, hirtus. *Pistilla* conica, hirta. *Ovula* 1–2, superposita. *Carpella* matura globosa, 5 mm. longa, stipitibus aequilongis.

Sarawak. Kuching, *Haviland*, 3333; *Haviland and Hose*, 3335.

The latter specimens, which are in fruit, have smaller leaves but appear to belong to the same species as the flowering ones.

677. **Melodorum fagifolium**, *Ridl.* [Anonaceae]; species *M. litseaefolio*, King, affinis, foliis haud tomentosis sed furfuraceis, paniculis brevibus, staminibus paucis, appendicibus rotundatis haud rostratis differt.

Frutex scandens, glabrescens, ramis rufo-furfuraceis. *Folia* ovata vel elliptica aut oblonga, apice cuspidata, basi rotundata superne parce furfuracea, subtus magis furfuracea, pallida, 7–10 cm. longa, 4–5 cm. lata, nervis 9-jugis superne inconspicuis subtus prominulis haud arcuatis; petioli atri, rufo-furfuracei, 1·5 cm. longi. *Paniculae* breves, subterminales, laxae, 7 cm. longae, furfuraceae; bracteae parvae, 1 mm. longae, lanceolatae, ovatae; pedicelli 7 mm. longi. *Alabastra* longe conica, triquetra, obtusa, acuminata. *Sepala* ovata, 2 mm. longa. *Petala* exteriora lanceolata, extus rufo-furfuracea, 1 cm. longa; petala interiora breviora, lanceolata, glabra. *Stamina* in verticillis 4, appendicibus rotundatis planis haud rostratis convexis glabris. *Pistilla* pauca, hirta.

Sarawak. Entagut River, *Hose*, 397.

678. **Melodorum paniculatum**, *Ridl.* [Anonaceae]; species *M. litseaefolio*, King, proxima, floribus majoribus, tomento partium juvenilium costae foliorum (subtus) et inflorescentiae rufo, staminibus paucis oblongis, appendicibus subtriangularibus rostratis distincta.

Frutex, partibus juvenilibus ferrugineo-tomentosis. *Folia* elliptica, acuminata, basi rotundata, coriacea, superne glabra costa media excepta, subtus rufo-tomentosa, 9–11 cm. longa, 2·5–5 cm. lata, nervis 11–12-jugis subtus prominulis; petioli validi 5 mm. longi. *Inflorescentia* terminalis, paniculata, 9–14 cm. longa, ramis 5 cm. longis, omnino rufo-tomentosa; bracteae lanceolatae, acutae, 1 mm. longae; pedicelli 1 cm. longi. *Alabastra* ovoidea. *Sepala* ovata, triangularia, 2 mm. longa. *Petala* exteriora ovata, subcuminata, obtusa, extus rufo-hirta, intus pallide tomentosa; petala interiora subaequilonga, crassa, carinata, apice fugaciter hirta. *Stamina* oblonga, pauca, appendicibus subtriangularibus rostratis lucidis brunneo-olivaceis. *Carpella* pauciora, pilis rufis longis tecta, apice glabra.

Sarawak. Kuching, *Haviland*, 1845.

679. **Melodorum rigidum**, *Ridl.* [Anonaceae]; scandens, foliis coriaceis laevibus nec tomentosis, calyce integro nec lobato gamophyllo, floribus singulis axillaribus insignis.

Frutex scandens, ramis nigris. *Folia* coriacea, elliptica, cuspidata, basi rotundata, 9–11 cm. longa, 3–4 cm. lata, supra laevia, costa depressa, nervis multijugis in utroque latere valde inconspicuis, subtus rufo furfuracea; petioli 1 cm. longi. *Flores* singuli, axillares; pedicelli rufo-furfuracei, 6 mm. longi. *Calyx* cupuliformis, integer, haud lobatus. *Petala* exteriora lanceolata, obtusa, basi latiora, superne attenuata, rufo-tomentosa, 1·5 cm. longa, ad basim 4 mm. lata; petala interiora multo breviora. *Carpella* matura cylindrica, obtusa, paullo ad basim angustata, 3 cm. longa, 2 cm. lata, tenuiter rufo-brunneo-velutinosa. *Semina* 7 atro-brunnea, lucida.

Sarawak. Kuching, *Haviland*, 421; *Beccari*, 393.

680. **Melodorum longipetalum**, *Ridl.* [Anonaceae]; species *M. fulgenti*, Hook. f., proxima, sed folia multo coriacea et laevia petala elongata, lineari-lanceolata, longiora.

Frutex ramis gracilibus, juvenilibus rufo-tomentosis. *Folia* lanceolata, acuminata, acuta, basi rotundata, supra glabra (sicca grisea), subtus glaucescentia, glaberrima costa rufo-tomentosa exepta, nervis supra inconspicuis subtus magis conspicuis in juvenilibus pilis tenuibus nitidis tectis, 6–7 cm. longa, 3 cm. lata; petiola 1 cm. longi, juventute rufo-tomentosi, adulti rufo-furfuracei. *Flores* siuguli, axillares; pedicelli 2 cm. longi, aut breviores; bracteae parvae, lineares. *Sepala* lanceolata, acuminata, 3 mm. longa. *Petala* exteriora lineari-lanceolata, acuminata, extus tenuiter rufo-tomentosa, intus glabra, 2·5 cm. longa, 4 cm. lata; petala interiora duplo breviora, linearia, acuminata, glabra. *Carpella* in toro cylindrico pilis sericeis flavis tecto.

Sarawak. Kuching, *Haviland*, 2102.
"Flowers sweet-scented."

681. **Melodorum ovalifolium**, *Ridl.* [Anonaceae]; frutex scandens, foliis parvis 5 cm. longis ovatis peltatis basi glandulis 2 instructis coriaceis glabris, floribus singulis extra-axillaribus, petalis longis angustis, staminum appendicibus elongatis quasi rostratis.

Frutex scandens, ramis tomentosis. *Folia* parva, ovata vel elliptica, breviter acuminata, obtusa, basi lata, peltata, glandulis elevatis 2 basalibus, 5 cm. longa, 2·5 cm. lata coriacea, superne glabra costa excepta, subtus glauca, nervis pilis rufo-tomentosis tectis; petioli pubescentes, 4 mm. longi. *Flores* singuli, foliis oppositi; pedicelli tenues, hirti, 2·5 cm. longi; bracteae minutae. *Sepala* ovata, obtusa, rufo-hirta, 2 mm. longa. *Petala* exteriora 2·5 cm. longa, basi 4 mm. lata, superne subabrupte angustata, linearia, obtusa, rufo-hirta; petala interiora brevissima, lanceolata, glabra, acuminata, 5 mm. longa. *Stamina* appendicibus prolongatis medio depressis.

Sarawak. Kuching, *Haviland*, 3141, 3151.

This I think is certainly a *Melodorum*, though in many points it resembles *Xylopia*, for the specimens show that it is clearly a climber. The peltate leaves with two basal glands are very peculiar.

682. **Xylopia congesta**, *Ridl.* [Anonaceae]; species *X. Scortechinii*, King, affinis, sed foliis floribusque minoribus, floribus congestis in massis parvis in ligno vetusto, petalis exterioribus et interioribus subsimilibus differt.

Frutex glabrescens. *Folia* lanceolata, breviter acuminata, basi breviter angustata, 8–9 cm. longa, 3·5 cm. lata, tenuiter coriacea, supra glabra costa depressa obscure pubescente excepta, nervis 11-jugis parce pubescentibus, nervulis invisis ; petioli 5 mm. longi. *Flores* congesti, e nodis ligni vetusti ; pedicelli 1 cm. longi, pubescentes. *Sepala* 1 mm. longa, rotundata, pubescentia. *Petala* exteriora e basi latiore linearia, 3 cm. longa, 1 mm. lata ; petala interiora similia, vix pubescentia. *Stamina* copiosa, appendicibus irregulariter rotundatis medio depressis. *Pistilla plura.*

Sarawak. *Beccari*, 2654.

683. **Xylopia coriifolia,** *Ridl.* [Anonaceae] ; arbor foliis ellipticis vel obovatis crasse coriaceis nitidis glabris, floribus paucis in massis extra-axillaribus, carpellis maturis cylindricis elongatis eis *X. ferrugineae*, Baill., similibus.

Arbor ramis validis. *Folia* elliptica, apice obtusa, vel obovata, basi angustata, 11–13 cm. longa, 4–5 cm. lata, valde coriacea, nitida, glabra, nervis in utraque pagina inconspicuis 7–8-jugis intra marginem anastomosantibus, nervulis secundarii fere aequalibus : petioli validi, 5 mm. longi. *Flores* pauci, extra-axillares, 2–3-ni ; pedicelli 1 cm. longi. *Sepala* ovata, acuta, glabra, 2 mm. longa. *Petala* lanceolata, acuta, sericea. *Carpella* matura cylindrica, basi angustata, 6 cm. longa, 7 mm. lata, stipitibus 1·5 cm. longis.

Sarawak. Kuching, *Haviland and Hose*, 3337 ; *Hose*, 1906 ; *Beccari*, 2652, 3335.

The flowers in all the specimens are very young.

684. **Xylopia Havilandii,** *Ridl.* [Anonaceae] ; arbor magna, *X. ferrugineae*, Baill., affinis foliis rigide coriaceis, sepalis connatis lobis brevibus, carpellis maturis obovoideis distincta.

Arbor magna, alabastris cupreo-hirtis. *Folia* rigide coriacea, lanceolata, utriuque attenuata, apice subacuta, 6–7 cm. longa, 2–3 cm. lata, glabra nisi costa pilis adpressis tecta, supra fusca, subtus rufo-glaucescentia (in sicco) ; petioli canaliculati, 0·5–1 cm. longi, lamina ad basin decurrente. *Flores* plurimi, in axillis racemosi, 3–4 in nodo ; pedunculi adpresse hirti, 1 cm. longi ; bracteae ovatae. *Sepala* connata, lobis ovatis acuminatis adpresse hirtis 3 mm. longis. *Petala* exteriora linearia, acuminata, basi rotundata, adpresse hirta, 1·6 cm. longa ; petala interiora angustiora, linearia, subaequilonga. *Stamina* longiuscula, linearia, appendicibus parvis conicis. *Pistilla* rufo-hirta, stylo longo glabro. *Carpella* (vix matura) obovoidea, apice rotundata, basi angustata, 2 cm. longa, 7 mm. lata.

Sarawak. Kuching, *Haviland and Hose*, 3352 ; *Haviland*, 2334.

"Petals yellow ; ovules numerous."

685. **Xylopia pulchella,** *Ridl.* [Anonaceae] ; species *X. rubellae*, Pierre, planta cochin-chinensi, affinis foliis parvis rotundatis, sepalis connatis, petalis subaequilongis angustis, staminum appendicibus parvis conicis distincta.

Arbor (vel frutex) glabra. *Folia* ovata, obtusa, rotundata vel paullo angustata, 4–5 cm. longa, 3–3·5 cm. lata, laevia (in sicco grisea, subtus rufo-brunnea), nervis utrinque 6–7, in pagina utraque inconspicuis ; petioli 5 mm. longi. *Flores* singuli, extra-axillares ;

pedicelli 5 mm. longi. *Calyx* gamosepalus, glaber, 2 mm. longus, dentibus 3 brevibus. *Petala* exteriora lanceolata, basi dilatata, 1·2 cm. longa, flava, pubescentia ; petala interiora multo angustiora, linearia, fere aequilonga, basibus rubris. *Stamina* plurima, gracilia, appendicibus conicis parvis rubris (ut in *X. obtusifolia*). *Styli* longi ; glutinosi (fide *Haviland*).

SARAWAK. Kuching, *Haviland*, 2101.

686. **Xylopia lanceola**, *Ridl.* [Anonaceae] ; species *X. caudatae*, King, valde affinis, floribus multo majoribus, petalis multo longioribus, foliis saepe multo majoribus distincta.

Arbor ramis gracilibus. *Folia* lanceolata vel elliptica, acuminata, obtusa, basi rotundata, 1·5–5 cm. longa, 2 cm. lata, subtus sericeo-pubescentia, costa pagina utraque pilis adpressis tecta, nervis valde inconspicuis ; petioli 2 mm. longi. *Flores* singuli vel bini ; pedicelli brevissimi. *Calyx* gamosepalus, 2 mm. longus, lobis brevibus. *Petala* exteriora anguste linearia, basi latiora, 6 mm. longa, 1 mm. lata, minute adpresse hirta. *Stamina* linearia, appendicibus minutis. *Pistilla* pauca, sericeo-hirsuta.

SARAWAK, *Beccari*, 1908, 3368.

687. **Mezzettia pauciflora**, *Ridl.* [Anonaceae] ; species *M. umbellatae*, Beccari, affinis, sed petalis brevioribus, floribus paucis racemosis, foliis rigide coriaceis lanceolatis acuminatis, fructu olivaeformi differt.

Folia lanceolata, longe acuminata, basi cuneata, 11–14 cm. longa, 3·5–4 cm. lata, coriacea, subtus pallida, nervis 6-jugis intra marginem arcuatim anastomosantibus, costa prominente, reticulationibus laxis pagina utraque conspicuis ; petioli 5 mm. longi. *Flores* pauci, racemosi ; pedunculi 1 cm. vel minus longi, extra-axillares ; pedicelli 5 mm. longi, coerulei (ex *Haviland*). *Sepala* ovata, parva, viridia. *Petala* e basi latiore linearia, 5 mm. longa, sordide alba (ex *Haviland*), interiora minora. *Stamina* quadrata, truncata, apice plana. *Ovarium* 1-ovulatum. *Carpellum* maturum 1, cylindricum, obtusum, olivaeforme, 4 cm. longum, 2 cm. latum glaucum (ex *Haviland*). *Semen* ellipsoideum, 2·5 cm. longum.

SARAWAK. Kuching, *Haviland*, 1952.

688. **Mezzettiopsis**, *Ridl.* [Anonaceae] ; genus novum *Mezzettiae*, Becc., affine, forma staminum, petalis exterioribus brevibus latis rotundatis distinctum.

Arbor habitu *Mezzettiae*, Becc. *Folia* tenuiter coriacea, oblonga, breviter petiolata. *Flores* copiosi, parvi, ex axillis foliorum paniculati hirti. *Sepala* parva, ovata, libera. *Petala* exteriora brevia, late rotundata, ovata ; petala interiora longiora, linearia, obtusa, crassiuscula, basi excavata. *Stamina* plura, elliptica, loculis latis apice angustatis acutis. *Pistilla* 6 vel plura, curva, stylo brevi. *Ovulum* 1, basale.

Mezzettiopsis Creaghii, *Ridl.* ; species unica.

Arbor ramulorum cortice nigro. *Folia* elliptica, breviter obtuse cuspidata, basi angustata, 12 cm. longa, 4 cm. lata, nervis utrinque 6 subtus elevatis intra marginem anastomosantibus, omnino glabra ; petioli 3 mm. longi. *Flores* parvi in paniculas breves hirtas 2 cm. longas dispositi ; bracteae ovatae, hirtae, 1 mm. longae. *Sepala*

minima, ovata, hirta. *Petala* exteriora brevia, late rotundata, ovata, hirta ; petala interiora linearia, obtusa, 5 mm. longa, crassa, subcarnosa, hirta, basibus excavatis androecium tegentibus. *Stamina* circiter 20, elliptica, apice cuspidata, 2-locularia. *Carpella* 6 vel plura, stamina vix superantia, stylis brevibus obtusis. *Ovulum* 1, basale.

British North Borneo. Tinkayo, *Creagh*.

This plant seems certainly allied to *Mezzettia* of which it has much the habit. The stamens have, however, the form of those of *Alphonsea*. It differs from every genus known to me in the short, broad, rounded outer petals which are much shorter than the inner ones, in the form of the stamens and in the numerous pistils with solitary basal ovules.

689. **Dalbergia maymyensis,** *Craib* [Leguminosae-Dalbergieae] ; ab affini *D. assamica*, Benth., stipulis linearibus, foliolis paucioribus, paniculis minoribus, racheos pedunculi ramulorumque juvenilium indumento rufo-tomentoso facile distinguenda.

Arbor mediocris (ex *Lace*) ; ramuli primo rufo-tomentosi, mox glabri, cortice fusco obtecti. *Folia* cum floribus coetanea, ad 12 cm. longa, 3–10-foliolata, petiolo ad 2 cm. longo suffulta, petiolo rachi petiolulisque primo rufo-tomentosis mox breviter crispatim albido-pubescentibus ; stipulae lineares, 2 mm. longae, 0·75 mm. latae, cito deciduae ; foliola alterna, ovato-elliptica vel elliptico-oblonga, apice parum retusa, basi terminalia cuneata, lateralia parum inaequalia, cuneata vel rotundata, ad 4·3 cm. longa, 2·1 cm. lata, rigida, juventute utrinque adpresse pubescentia, mox utrinque tenuiter pilosa, nervis lateralibus utrinque 6–8 cum nervis transversis pagina superiore prominentibus inferiore conspicuis, petiolulis ad 4 mm. longis suffulta. *Paniculae* axillares, ad 3·5 cm. diametro, pedunculo communi 3–4 cm. longo ut ramuli rufo-tomentoso suffultae ; bracteae bracteolaeque deciduae ; pedicelli 2 mm. longitudine vix attingentes. *Calycis* tubus 2 mm. longus ; lobus infimus lanceolatus, acutiusculus, 2·5 mm. longus, 1·25 mm. latus ; lobi laterales oblongi, obtusi, circiter 1·5 mm. longi et lati ; lobi infimi basi connati, circiter 2 mm. longi et lati. *Vexillum* reflexum, orbiculatum, circiter 6 mm. diametro ; alae 6 mm. longae, 3·5 mm. latae, basi breviter auriculatae ; carina circiter 3·75 mm. longa et 2·75 mm. lata ; petalorum omnium ungues circiter 1·5 mm. longi. *Stamina* isodiadelphia. *Ovarium* 4 mm. altum, 4-ovulatum, stipite 1·5 mm. longo suffultum, suturis pubescens ; stylus cylindricus 1·5 mm. longus, stigmate parvo capitato. *Legumen* samaroideum, plerumque late ligulatum, apice acutum, basi in stipitem attenuatum, ad 7 cm. longum et fere 1·5 cm. latum, glabrum, tenuiter reticulatum nisi umbone distincte reticulatum, 1- vel 2-spermum, stipite ad 8 mm. longo suffultum.

Indo-China. Upper Burma : Maymyo Plateau, 1050 m., *Lace*, 3113, 4134, 5793, 5848 ; Mu River, *Smales*.

690. **Sedum Woodwardii,** *N.E.Brown* [Crassulaceae] ; affinis *S. Aizoo*, Linn. sed foliis obovatis obliquis obtuse dentatis et cymis majoribus laxioribusque differt.

Herba perennis, ubique glabra. *Caules* circa 30 cm. alti, simplices, 5 mm. crassi, leviter pluri-angulati, virides. *Folia* alterna, laxa, 3·5–6 cm. longa, 2–3 cm. lata, oblique cuneato-obovata, obtusa,

superne irregulariter et obtuse dentata, inferne longe cuneato-angustata, tenuiter carnosa, viridia. *Cyma* 7–9 cm. diametro, subplana, 2–5-ramosa ; rami dichotomi, sublaxi, bracteati, virides. *Bracteae* inferiores magnae, foliiformes, ceterae multo minores 0·8–2·5 cm. longae, 3–10 mm. latae, oblique cuneato-oblanceolatae, acutae vel obtusae, integrae. *Flores* 5–10 mm. sejuncti, sessiles, 1·3 cm. diametro. *Sepala* 4–5 mm. longa, lineari-subulata, obtusa, carnosa, viridia. *Petala* 5, stellatim radiata, 7 mm. longa, 2 mm. lata, lanceolata, acuta, lutea. *Stamina* 10, erecta, lutea. *Carpella* arcte contigua, erecta, pallide lutea.

The origin of this plant is not known with certainty. It was sent to Kew for name on Sept. 24, 1912, by Mr. Robert Woodward, Junior, of Arley Castle, with the statement that it had appeared in a bed with some seedlings of a species of *Sambucus*, of which the seeds were collected in the Rocky Mountains, near Glacier, on Sept. 3, and sown on Nov. 11, 1911, germinating in May, 1912. As the *Sedum* is stated to have a rather woody root-stock with many short shoots, it seems scarcely credible that it is only of four months' growth from seed. There is just a possibility, however, that it may be a stray seedling from a bed about 3 yards away, where seedlings of Wilson's 1910–1911 Chinese collection are growing. This latter assumption seems more probable, because there is no species nearly allied to it known from North America, whilst its nearest ally (*S Aizoon*, L.), is a native of Northern Asia. *Sedum Woodwardii*, however, is not represented among Wilson's dried plants at Kew.

LIV.—THE SOURCE OF SIAM BENZOIN.

(*Styrax benzoides*, Craib).

The lack of information as to the source of Siam benzoin has been pointed out at various times in the Pharmaceutical Journal by Mr. E. M. Holmes and in response to his application for assistance to trace the origin of the product Dr. Kerr was communicated with on the subject. We are much indebted to Dr. Kerr for his kind reply to our enquiry from which we have extracted the following interesting information.

The *Styrax* tree which grows on Doi Sootep and which is fairly common at 600–1200 m. altitude in evergreen jungle, particularly in that type of forest where *Quercus Junghuhnii* predominates and where the soil consists of a stiff red clay overlain by a thick layer of humus, was, from flowering material only, believed to be *S. Benzoin* (*Kew Bull.* 1911, p. 409). The receipt of fruiting specimens showed, however, that it was not *S. Benzoin* but a new species closely allied to *S. suberifolius* and since described as *S. benzoides* (*Kew Bull.* 1912, p. 267). *S. benzoides*, on Doi Sootep, grows rapidly and attains a height of 12–15 m. and a girth of about 9 dm. but most of the trees are smaller though in other parts larger trees are reported. Several Kămus, natives of the Luang Prăbang region from which most of the gum comes, have, without a leading question, identified the Doi Sootep tree as ton kŭm yan, kum yan being the Lao and Siamese name for gum benzoin. It

must be admitted that small specific differences might not be noted by the natives though they are often acute observers of such points particularly where economic plants are concerned.

Dr. Kerr's belief that this tree is the source of the Siamese gum benzoin has been confirmed by the receipt at Kew of a small sample of the gum collected from the Doi Sootep trees which in smell, taste and fumes is identical with commercial Siamese gum benzoin. Though the gum is only casually collected in the Chiengmai district yet nearly every tree examined on Doi Sootep had been notched and in some cases completely felled. In the majority of cases the cuts were very old and on most trees no gum at all was observed but on a few there was a small incrustation of gum along the cuts. The largest piece of gum obtained weighed about 2·5 grammes and was found in a hole made by some wood-borer. It was a homogeneous, transparent, pale amber piece with the characteristic odour of Siam benzoin.

The principal method of collecting the gum is by making V-shaped incisions through the bark. The gum runs slowly into bamboo joints placed at the bottom of the V and is not collected until a few weeks after the incision is made. This is generally done during the hot season. Gum is also frequently found in holes made by wood-borers and sometimes on or in the ground at the foot of the trunk. The quality of the gum is the same by whatever method it is collected. Whether any particular tree will yield gum or not can only be ascertained by tapping as only the larger trees and not even all of them yield gum.

None of the gum obtained near Chiengmai is exported, but nearly all of it is used locally, mixed with pig's fat, as an application for the hair. Most of the gum which reaches Chiengmai is brought there by the Kămus during the cold season from the Luang Prăbang region to the East of the Mê Kong. A native merchant buys it and ships it to Bangkok. This merchant estimates his yearly purchases at 5 sens (approximately 10 cwt.), but for the last two years the quantity has been less because, he says, it no longer pays the Kămus to collect it and bring it down. Although the merchant had heard that the tree grew on Doi Sootep he had never bought gum from any district but Luang Prăbang.

Gum benzoin is also brought to Korat in Lower Siam but no information as to its source is available.

LV.—MISCELLANEOUS NOTES.

Mr. F. A. Stockdale.—We learn that Mr. F. A. Stockdale, Assistant Director of the Department of Science and Agriculture and Government Botanist, British Guiana, has been appointed Director of Agriculture, Mauritius.

Mr. Walter Victor North, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for India in Council, on the recommendation of Kew, a probationer gardener for service in India.

Dr. M. C. Cooke.—In consequence of the announcement in the Journal of Botany for September, 1912, p. 296, which we read with deep regret, of the death of our former colleague, Dr. M. C. Cooke, a notice of his life and scientific work appeared in the last number of the *Kew Bulletin*. It gives us much pleasure to learn from Dr. Cooke himself that he is in excellent health.

John Davies Enys.—We notice with regret the announcement of the death of Mr. J. D. Enys of Enys, Penryn, Cornwall, an old and valued correspondent of Kew. Mr. Enys, who was born in October, 1837, was the representative of a family which has been seated at Enys since the time of Edward I. He resided for many years in New Zealand, where he was a magistrate from 1865 to 1891, and no doubt to his long connection with that Colony must be attributed his interest in the New Zealand Flora.

A brief account of the garden at Enys was given in *Kew Bulletin*, 1893, p. 357, and note is made of some of the interesting New Zealand plants cultivated there. Among them were plants of *Fagus Solandri* (not *F. Cunninghamensis* as stated in *Kew Bulletin*) which Mr. Enys brought back to Cornwall from New Zealand. Among other interesting introductions may be mentioned *Fagus Cliffortioides*, a species growing at an altitude of about 2500 feet between Christchurch and Hokitika, plants of which were sent to Kew by Mr. Enys in 1888. One of his first gifts to Kew was the very fine specimen of the New Zealand sheep plant *Raoulia mammillaris*, now in Museum No. I., which he sent over to England in 1881.

Among horticulturists he is renowned for the introduction and successful culture of the Chatham Island Forget-me-not, *Myositidium nobile*. In a letter to Kew in 1894 he wrote that the leaves of his plants at Enys were nearly 18 inches across, of a vivid green, and nearly 3 feet high.

Another tie with Kew lay in the fact that he was a cousin of Miss Marianne North.

He died on November 7th at Leeds, where he had gone to undergo an operation.

Propagation of Rhamnus Purshiana (Cascara Sagrada).—In an article on Cascara Sagrada which appeared in the *Kew Bulletin*, 1908, p. 429, the question of the tree proving a remunerative culture in parts of the British Isles was discussed. With a view to having the tree tested in quantity two separate consignments of seeds were obtained from North America and distributed amongst a number of gardens in various parts of Great Britain and Ireland. Unfortunately, the greater part failed to germinate. As the few trees already in cultivation do not bear seed in great abundance, it was desirable to find out if the tree could be increased by cuttings. A considerable quantity have been put in at various seasons, from the soft cuttings of young wood in June, to autumn cuttings in gentle heat and leafless cuttings in cold frames in early winter.

The autumn and winter cuttings have hitherto been complete failures and the greatest success has been secured with those made of younger wood. In June some cuttings made of the new shoots were put in mild bottom heat in a close frame ; they were three or four inches long with a "heel" of older wood at the base, and 50 per cent. took root. In early July, when the wood had, of course, become firmer, a second batch of similar cuttings was put in under the same conditions ; of these about 85 per cent. took root. From present experience, therefore, it would seem that July is the best month to take cuttings. Vegetation in the earlier part of the summer of 1912 was considerably in advance of the normal, so that in early July the shoots would be about as far advanced as, in ordinary years, they are in mid or late July. With a little more practice and knowledge of those small particulars in the selection, making and treatment of the cuttings—on which, as propagators know, success so much depends in the case of plants like the present, not among the easiest to deal with—it seems likely that we may expect to get an almost perfect "strike" of July cuttings.

W. J. B.

Botanical Magazine for November.—The plants figured are *Eriopsis Helenae*, Kränzl, (t. 8462) ; *Mesembryanthemum Pearsonii*, N. E. Brown (t. 8463) ; *Cornus controversa*, Hemsl. (t. 8464) ; *Iris caroliniana*, S. Wats. (t. 8465) and *Corokia virgata*, Turrill (t. 8466).

We are indebted to Messrs. Sander & Sons for the introduction of *Eriopsis Helenae* to cultivation. The genus which is wholly South American contains only six species. The subject of the illustration is a native of Peru and flowered at Kew for the first time in 1909 ; the plant having been presented by Messrs. Sander in 1894. The description was drawn up by Kränzlin from a specimen which flowered at St. Albans in 1897. The flower scapes, some 60 cm. long, with their numerous yellowish-brown flowers are very striking.

Mesembryanthemum Pearsonii is one of this remarkable group of South African plants with a single pair of leaves and shows considerable resemblance to *M. testiculare* and *M. Bolusii*. The leaves, however, are much larger than those of the former species and from the latter it differs particularly in having no style but a large sessile discoid stigma. The plant which forms the subject of the illustration was collected during the Percy Sladen Expedition to the Orange River and sent by Prof. H. H. W. Pearson to Kew in 1911 where it flowered shortly afterwards.

The *Cornus* is one of the most elegant of small deciduous trees in cultivation. The leaves are alternate, though this is not very clearly shown in the figure, and in this respect it differs from all other species except *C. alternifolia*, Linn. The plant figured was obtained from Messrs. J. Veitch & Sons. The confusion which has arisen in connection with this species and *C. brachypoda* has been dealt with under *C. macrophylla*, Wall. (t. 8261). *C. controversa* is a native of the Himalaya and Eastern Asia.

Iris caroliniana is an interesting species from Virginia and Carolina and was first discovered by Mr. W. A. Manda in North Carolina. It was described by the late Mr. S. Watson from a specimen which flowered in the Harvard Botanic Gardens. The species is closely allied to *I. versicolor*, Linn., but can easily be distinguished by its larger lavender-coloured flowers and green leaves. The plant figured was raised from seeds presented to Kew by the Missouri Botanic Gardens in 1908 but the species had been in cultivation at Kew for some ten years previously.

The *Corokia* figured at t. 8466 has been in cultivation at Kew since 1907 when it was raised from a cutting sent to Kew by the Editor of the Gardeners' Chronicle. It is nearly allied to *C. Cotoneaster* but can be distinguished especially by the larger leaves and scarcely tortuous branches. Only three other species have been described and our plant may be identical with one noted by Mr. Cheeseman in New Zealand, without flowers, in which the branches were not tortuous and the leaves were similar to those of the species illustrated.

Opuntias in the Canary Islands.—Whilst spending some months in the Canary Islands I took the opportunity to study the various species of Opuntia growing there, and noticed the following species in Grand Canary and Teneriffe :—

1. *Opuntia brasiliensis*, Haw. In a garden at Orotava, Teneriffe. Lowe records this in his "Flora of Maderia," as having been introduced into that island, but he does not state if it had become wild or not, in his time.

2. *Opuntia Ficus-indica*, Webb and other writers, but not the true *O. Ficus-indica* = *O. Tuna* of some writers. This plant Webb called *Opuntia Ficus-indica*, in his "Histoire Nat. des Iles Canaries," iii., 1840, p. 208, stating that it has two varieties :—

   a. spinosa, with yellowish-white spines.

   β. inermis aut parce spinosa, unarmed or nearly so.

It is also the plant which was collected and distributed by Bourgeau under his No. 1239, with the name of *Cactus Ficus-indica*, and is called *O. Ficus-indica* by Pitard and Proust—"Les Iles Canaries," 1909, p. 197. It is certainly not the *O. Ficus-indica* of the coast regions of the Mediterranean, nor the true *Cactus Ficus-indica*, L.

It appears to have been the plant used principally for the Cochineal industry, and is still extensively cultivated at Arucas, in Grand Canary, for this purpose. Where grown for rearing and feeding the Cochineal insect it rarely seems to flower and fruit, but elsewhere—on abandoned cochineal plantations—its rich orange flowers, turning to pink as they fade, are abundantly produced and the fruit is eaten in considerable quantity.

The thorns of this Opuntia are short and white, generally two or three together, but in old plants often single, or almost entirely absent.

3. *Opuntia Dillenii*, Haw. Very common close to the sea in Grand Canary, and used for hedges in Teneriffe. This is the *O. Tuna* of Webb and of Bourgeau No. 263, and also of Pitard and Proust.

   The spines of this plant are used in the cochineal industry to pin on the rags that protect the insect.

4. *Opuntia monacantha*, Haw. Only found by me once in Grand Canary—probably in what had been a garden.

5. *Opuntia robusta*, Wendl. Cultivated, I believe, formerly for Cochineal, now allowed to grow in a wild state in Teneriffe for its fruit, which according to Schumann "Gesamtbeschreibung des Kakteen," p. 742, is considered in Mexico one of the best to eat.

6. *Opuntia tomentosa*, Salm-Dyck. In Teneriffe, but not very plentiful. On some plants I found Cochineal doing well.

7. *Opuntia* sp., from Grand Canary—a plant with rather long dark thorns, a specimen of which is now in cultivation in the Royal Botanic Gardens, Calcutta, as No. 33,924. It has not yet been identified.

8. *Opuntia* sp. Another species with straight spines from Teneriffe. A specimen of which is now in cultivation at the Royal Botanic Gardens, Kew.

M. Burkill.

Marram Grass for Paper-making.—Among other plants suggested as suitable for the Paper-maker which have recently been examined in this connection is the common Marram Grass of our coasts, *Ammophila arenaria*, Link.

This grass, as is well known, is grown on the sand hills around our shores and acts as a very valuable sand-binder. It now appears that it possesses quite useful qualities as a source of material for paper-making. Messrs. Clayton Beadle and Stevens have kindly examined a consignment of Marram Grass sent through Kew from the Norfolk sand hills. They inform us that the grass was boiled under pressure, without passing through crushing rollers, and then bleached. The figures for the yield of unbleached and bleached fibres, expressed on the original green weight of stem as received and on the dry weight, are as follows :—

	Green Stem.	Dry Stem.
Unbleached	17·7 per cent.	31·4 per cent.
Bleached	13·1 „	25·0 „

The average length of unbeaten fibres contained in the pulp taken on an average of ten measurements was found to be 0·65 mm.

Marram Grass is found to produce a soft pulp with a short tear which more nearly resembles in general feel and external appearance the pulp produced from Esparto or chemical aspen wood pulp.

The primary function of Marram Grass is of course as a sand-binder, but it is possible that should it be deemed of sufficient importance as a paper-making material its cultivation could be extended over considerable tracts of sandy country bordering the coast in various parts of the British Isles.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 10.] [1912.

LVI.—CONTRIBUTIONS TO THE FLORA OF SIAM.

II. List of Siamese Plants, with Descriptions of New Species—*continued.**

W. C. Graib.

The present contribution, dealing with the Monocotyledones and Gymnosperms with the exception of the Family Orchidaceae, which is reserved for a separate paper, is continued on exactly the same lines as the earlier papers dealing with the Dicotyledones.

Just before the publication of the first contribution—the Polypetalae — there appeared in Bot. Centralbl., Beihefte xxvii. 2, pp. 455–507, a paper by C. C. Hosseus entitled "Beiträge zur Flora Siams," and before the publication of the second contribution—the Gamopetalae and Incompletae—there appeared in the same publication (vol. xxviii. 2, pp. 357–457) a paper entitled "Die botanischen Ergebnisse meiner Expedition nach Siam" by the same author. In the following enumeration these papers are cited briefly Hosseus i. and Hosseus ii., respectively.

MONOCOTYLEDONES.

Hydrocharidaceae.

Enhydrias angustipetala, *Ridley*—Fl. Indo-Chine, vi. p. 17. *Lagarosiphon Roxburghii*, F.B.I., v. p. 659, in part.

Chiengmai, Doi Sootep, in swamp, 330 m., *Kerr*, 1626*b*.

Distr. Malay Peninsula, Indo-China, Japan.

Ottelia alismoides, *Pers.*—F.B.I., v. p. 662.

Chiengmai, in marsh at foot of Doi Sootep, 300 m., *Kerr*, 654.

Distr. Trop. Asia and Australia.

Burmanniaceae.

Burmannia disticha, *Linn.*—F.B.I., v. p. 664; Fl. Indo-Chine, vi. p. 25.

Chiengmai, Doi Sootep, in open marshy ground, 660 m., *Kerr*, 1204.

Distr. S.E. Asia to Australia.

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* Continued from *K.B.*, 1911, p. 474. See also *K.B.*, 1912, pp. 144 and 264.

(27089—6a.) Wt. 189—808. 1125. 12/12. D & S.

Burmannia uniflora, *Rottler ex Spreng.* ?

Chiengmai, in open marshy ground on Doi Sootep, 480–720 m., *Kerr*, 929, 2644 ; Wang Djao, 100 m., *Hosseus*, 115.

This is *B. coelestis*, Don, in the wide sense as understood in the Flora of British India. Hosseus ii. p. 374 refers his 115 and a plant from Ban Jang not seen by the writer to *B. coelestis*.

Burmannia Wallichii, *Hook. f.*, F.B.I., v. p. 666 ; Fl. Indo-Chine, vi. p. 21.

Chiengmai, Doi Sootep, on mossy bank in evergreen jungle by a stream, 540 m., *Kerr*, 926.

Distr. Burma, Hong-Kong.

Scitamineae.

Globba Clarkei, *Baker*, F.B.I., vi. p. 201 ; K. Schum., Engler Pflanzenr., Zingib., p. 134.

Chiengmai, Doi Sootep, in evergreen jungle, 900–1500 m., *Kerr*, 1370, 1370*a*.

Distr. Sikkim, Khasia.

Globba Kerrii, *Craib*, sp. n., ob staminodia majuscula distincta.

Herba erecta, 43–82 cm. alta. *Folia* lanceolata, apice acuminata, acuta, basi in petiolum brevissimum attenuata, 12–22 cm. longa, ad 2 cm. lata, utrinque glabra ; vaginae infimae circiter 6, parum rubrescentes, sub-tomentosae, supremae parce breviter pubescentes, omnes ciliatae ; ligula circiter 2 mm. longa. *Panicula* erecta, ad 9 cm. longa, ramis inter se satis distantibus mox patulis infimis ad 3 cm. longis glabris ; bracteae bracteolaeque deciduae ; bulbilli rari. *Calyx* 5 mm. longus, lobis deltoideis 1·5 mm. longis ciliatis. *Corollae* tubus 1·3 cm. longus, extra puberulus, lobi ad 7 mm. longi. *Staminodia* lateralia subelliptica, 1·7 cm. longa, 8 mm. lata, corollae lobos insigniter excellentia ; labellum 1·2 cm. longum, bilobatum, lobis oblongis obtusis 5 mm. longis 1·5 mm. latis ; anthera 2·25 mm. longa, ala inaequaliter bilobata 2·5 mm. longa utrinque instructa. *Ovarium* ad 4 mm. altum.

Chiengmai, Doi Sootep, in open grassy jungle, 900–1200 m., *Kerr*, 1278.

Globba Nisbetiana, *Craib*, sp. n., *G. pauciflorae*, King ex Baker, facie similis sed indumento crassiore distinguenda.

Caules 7–15 cm. alti. *Folia* ovato-lanceolata, acuminata vel inconspicue acuminata, acuta, basi late cuneata, 2–4·5 cm. longa, 0·8–1·6 cm. lata, breviter petiolata, supra pilis longis rigidis hic illic instructa, subtus tenuiter pilosa, ciliata ; vaginae infimae ad 4, parce hirsutae, ciliatae ; ligula vix 1 mm. longa, pilosa. *Inflorescentia* pauciflora, erecta ; bracteae oblongae, acuminatae, 6 mm. longae, 3 mm. latae. *Calyx* 2·5 mm. longus, lobis brevibus acutis. *Corollae* tubus 1·6 cm. longus, extra puberulus, lobi ad 5 mm. longi. *Staminodia* lateralia elliptica, circiter 8 mm. longa et 5 mm. lata ; labellum 8 mm. longum, bilobum, lobis parum lobatis ; anthera 2 mm. longa, ala inaequaliter biloba (lobo infero supero parum minore) ad 2·5 mm. longa 1·25 mm. lata utrinque ornata. *Ovarium* 1·5 mm. altum.

Chiengmai, Doi Sootep, in evergreen jungle, 900–1200 m., *Kerr*, 1291.

Globba platystachya, *Baker*, F.B.I., vi. p. 206 ; K. Schum., Engler Pflanzenr., Zingib., p. 144 ; Fl. Indo-Chine, vi. p. 33.

Petchabouri River (ex *Fl. Indo-Chine*).

Distr. S. India.

Globba purpurascens, *Craib*, sp. n., *G. cernuae*, Baker, affinis sed foliorum pagina inferiore glabra et ut vaginis purpurascente, panicula erecta distinguenda.

Herba ad 37 cm. alta, vaginis praesertim supremis foliorumque pagina inferiore purpureis. *Folia* ovato-lanceolata vel lanceolata, apice acuminata, acuta, basi cuneata, 6–11·3 cm. longa, 1·1–3·2 cm. lata, brevissime petiolata, utrinque pilosula ; vaginae infimae ad 6, parce breviter pubescentes, conspicue ciliatae ; ligula brevis, superne strigosa, strigoso-ciliata. *Panicula* 4–5 cm. longa, erecta ; bracteae infimae virides, lanceolatae vel ovato-lanceolatae, acutae, ad 1·8 cm. longae, bulbilliferae ; bulbilli ovoidei, obtuse acuminati, verrucosi, 3 mm. longi. *Calyx* 3 mm. longus, breviter 3-lobatus. *Corollae* luteae (ex *Kerr*) tubus 1·7 cm. longus, lobi ad 5 mm. longi. *Staminodia* lateralia oblongo-lanceolata, 5 mm. longa, 1·5 mm. lata ; labellum 6 mm. longum ; anthera 2 mm. longa, alis duobus oblongo-lanceolatis supremis ad 3 mm. longis et 1 mm. latis infimis paullulo minoribus utrinque ornata. *Ovarium* vix 2 mm. altum, parum verrucosum.

Chiengmai, Doi Sootep, in evergreen jungle, 1050 m., *Kerr*, 1316.

Globba reflexa, *Craib*, sp. n., a *G. versicolore*, Smith, foliis angustioribus rigidioribus, panicula nutante, bracteis sub anthesin reflexis recedit.

Caulis 40–56 cm. altus. *Folia* lineari-lanceolata, apice acuta, basi obtusa, 6·5–20 cm. longa, 0·7–1·4 cm. lata, sessilia, supra fere glabra, subtus pilosa, chartacea ; vaginae infimae saltem 5, ciliatae ; ligula brevis, longe ciliata apicemque versus pilosa. *Panicula* cernua, ramis satis remotis obliquis vel fere patulis primo ut rachi puberulis mox glabris circiter 2 cm. longis ; bracteae oblongo-lanceolatae, persistentes, reflexae, ad 1·5 cm. longae et 3 mm. latae ; bulbilli deficientes. *Calyx* 4·5 mm. longus, breviter 3-lobatus. *Corollae* luteae (ex *Kerr*) tubus 1·6 cm. longus, lobi 5–6 mm. longi. *Staminodia* lateralia 1·2 cm. longa ; labellum 8 mm. longum, bilobatum, lobis anguste oblongis obtusiusculis ; anthera 2·5 mm. longa, latere utroque alis duobus acutis 2·5 mm. longis supremis 1 mm. latis infimis 0·5 mm. latis ornata. *Ovarium* verruculosum, 2 mm. altum.

Chiengmai, Doi Sootep, 600–900 m., *Kerr*, 616, 1202.

Globba Schomburgkii, *Hook. f.*—Williams, Bull. Herb. Boiss., iv. (1904) p. 361, *in part* ; K. Schum., Engler Pflanzenr., Zingib., p. 153 ; Fl. Indo-Chine, vi. p. 33 ; Hosseus, ii. p. 374.

Chiengmai, Doi Sootep, in mixed and deciduous jungles, 330–450 m., *Kerr*, 1298 ; Kampeng, 50 m., *Hosseus*, 33 ; Bangkok, *Schomburgh*, 306 ; Petchabouri, *Pierre*, 48.

Distr. Cambodia.

The Anhin plant (*Schomburgh*, 255) referred by Williams, l.c., to this species has been described as a distinct species under the name *G. colpicola*, K. Schum.

Globba xantholeuca, *Craib*, sp. n., *G. panicoidi*, Miq., affinis sed foliis haud glabris facile distinguenda.

Caules 30–58 cm. alti. *Folia* anguste lanceolata, apice attenuata, acuta, basi late cuneata, 9·5–15 cm. longa, ad 1·7 cm. lata, brevissime petiolata, supra pilis longis rigidis basi tuberculatis hic illic instructa, subtus pilis similibus nisi tenuioribus numerosioribus; vaginae infimae circiter 5, conspicue ciliatae; ligula ad 2·5 mm. longa, ciliata. *Panicula* erecta, ad 6 cm. longa, pedunculo ad 6 cm. longo suffulta, glabra; rami patuli, inter se remoti, infimi ad 3 cm. longi, pauciflori; bracteae bracteolaeque cito deciduae; bulbilli rari, ambitu oblongi, acuminati, ad 1·5 cm. longi, glabri. *Calyx* vix 5 mm. longus, glaber; lobi lanceolati, acuti vel subacuti, vix 2 mm. longi. *Corollae* albae (ex *Kerr*) tubus 1·2 cm. longus, lobi 3·5–4 mm. longi. *Staminodia* lateralia 4 mm. longa; labellum luteum (ex *Kerr*), emarginatum; anthera 1·5 mm. longa, latere utroque ala lineari-lanceolata acuta 3·5 mm. longa 0·75 mm. lata instructa.

Meh Ping, Kampeng, in mixed jungle, *Kerr*, 2031.

Globba Yeatsiana, *Craib*, sp. n., a *G. versicolore*, Smith, foliis subtus glabris recedit.

Caules circiter unimetrales. *Folia* lanceolata vel late lanceolata, apice acuminata, acutissima, basi late cuneata, ad 28 cm. longa et 4 cm. lata, petiolo ad 7 mm. longo suffulta, utrinque glabra; vaginae infimae circiter 5, stramineae, ciliolatae; ligula 2–2·5 mm. longa, ciliolata. *Panicula* plerumque cernua, ad 13 cm. longa; rami divaricati, satis distantes, ad 6 cm. longi, pauciflori, glabri; bracteae deciduae, oblongo-lanceolatae, acutiusculae, dorso carinatae, 5 mm. longae, 1·75 mm. latae. *Calyx* 5 mm. longus, 3-lobatus. *Corollae* luteae (ex *Kerr*) tubus 1·7 cm. longus, extra puberulus, lobi ad 7 mm. longi. *Staminodia* lateralia linearia, 1·4 cm. longa, vix 2 mm. lata; labellum 1·2 cm. longum, bilobum, lobis oblongis apice rotundatis; anthera 2 mm. longitudinis paululo excedens, ala subaequaliter bilobata 2·5 mm. longa 1·5 mm. lata lobis acutis utrinque instructa. *Ovarium* 4 mm. altum.

Chiengmai, Doi Sootep, in evergreen jungle, 960 m., *Kerr*, 1214.

Gagnepainia Godefroyi, *K. Schum.*, Engler Pflanzenr., Zingib., p. 130; Fl. Indo-Chine, vi. p. 43.

Chiengmai, Doi Sootep, generally in shady spots near a stream, 720 m., *Kerr*, 615.

Distr. Laos (ex *Fl. Indo-Chine*).

I am indebted to Mons. Gagnepain for the identification of this plant after comparison with the types in Herb. Mus. Paris. At first I had regarded it as a new species allied to *G. Godefroyi* but from the copious notes supplied by Mons. Gagnepain the appendages of the lip are very variable. There are 5 glands or appendages to the labellum all subject to variation in length and sometimes some of them are almost completely wanting as must have been the case with the flower serving for the figure in Engler Pflanzenr., l.c., fig. 18e where the two lower ones are not represented at all.

Kaempferia elegans, *Wall.?*—F.B.I., vi. p. 222; K. Schum., Engler Pflanzenr., Zingib., p. 82.

Chiengmai, Doi Sootep, in mixed jungle, 330 m., *Kerr*, 1911.

Distr. Burma.

Kaempferia Galanga, *Linn.*—F.B.I., vi. p. 219; K. Schum., Engler Pflanzenr., Zingib., p. 77; Fl. Indo-Chine, vi., p. 49.

Meh Ping, Muang Hawt, in deciduous jungle, 240 m., *Kerr*, 2012.

Distr. S.E. Asia.

Lao name, Wan Ten Dĭn Yen (ex *Kerr*).

Kaempferia pandurata, *Roxb.*—F.B.I., vi. p. 220; K. Schum., Engler Pflanzenr., Zingib., p. 82; Fl. Indo-Chine, vi. p. 52.

Chiengmai, Doi Sootep, in mixed jungle, 330 m., *Kerr*, 1341.

Distr. S.E. Asia—often cultivated.

Kaempferia rotunda, *Linn.*—F.B.I., vi. p. 222; K. Schum., Engler Pflanzenr., Zingiber., p. 87; Fl. Indo-Chine, vi. p. 47; Hosseus, ii. p. 374.

Chiengmai, very common in deciduous and open jungles on Doi Sootep, 300–1350 m., *Kerr*, 637; Doi Sootep, 700–1300 m., *Hosseus*, 437.

Distr. S.E. Asia—often cultivated.

Stahlianthus macrochlamys, *Craib*, comb. nov. *Kaempferia macrochlamys*, Baker, F.B.I., vi. p. 223; K. Schum., Engler Pflanzenr., Zingib., p. 85.

Chiengmai, Doi Sootep, in evergreen jungle, 900 m., *Kerr*, 1807.

Distr. Tenasserim.

To *Stahlianthus* also belong *K. involucrata*, King ex Baker and probably *K. Andersoni*, Baker.

Gastrochilus longiflora, *Wall.*—F.B.I., vi. p. 217, in part; K. Schum., Engler Pflanzenr., Zingib., p. 95.

Chiengmai, Doi Sootep, in evergreen jungle, 750 m., *Kerr*, 1379.

Distr. Himalaya, Parasnath, Assam, Burma.

Gastrochilus parvula, *Wall. ex Baker*, F.B.I., vi. p. 218; K. Schum., Engler Pflanzenr., Zingib., p. 92.

Chiengmai, Doi Sootep, in damp evergreen jungle, 900–1200 m., *Kerr*, 737.

Distr. Upper Burma.

Hedychium ellipticum, *Ham. ex Smith*—F.B.I., vi. p. 228; K. Schum., Engler Pflanzenr., Zingiber., p. 47.

Chiengmai, Doi Sootep, on rocks in open jungle, 900–1350 m., *Kerr*, 788, 2658.

Distr. Himalaya, Khasia.

Hedychii elliptici, *Ham. ex Smith*, var. vel sp. nov.? Differt habitu robustiore, spicis bracteisque longioribus, floribus paulo majoribus.

Chiengmai, Doi Sootep, 1650 m., *Kerr*, 1304.

Hedychii Gardneriani, *Wall.*, var.? Differt spicis densioribus, bracteis majoribus floribusque albis.

Chiengmai, Doi Sootep, 1650 m., *Kerr*, 1305.

Curcuma (Exantha) ecomata, *Craib*, sp. n., ob inflorescentiam densam comamque deficientem distincta.

Folia oblongo-elliptica, apice breviter acuminata, acuta, basi in petiolum attenuata, ad 39 cm. longa et 13 cm. lata, supra glabra vel costa tantum parcissime setulosa, subtus tenuiter hirsutula; petioli ad 20 cm. longi; vaginae aphyllae saltem 4, superiore 20 cm. longa. *Pedunculus* ad 7 cm. longus, basi squamis duobus pedunculo paululo longioribus instructus; bracteae inter se plus

minusve connatae, sicco stramineae vel brunneae, interdum apicem versus rubrescentes, apice rotundatae, ad 3 cm. longae et 2·7 cm. latae, marginatae, glabrae. *Calyx* hyalinus, circiter 1 cm. longus. *Corollae* tubus vix 3 cm. longus, superne ampliatus, pilis deflexis extra instructus ; lobi lanceolati vel oblongo-lanceolati, acuti, inter se subaequales, ad 15 mm. longi et 4·5 mm. lati. *Staminodia* purpurea (ex *Kerr*), subrhomboidea, acuta, 15 mm. longa, 7 mm. lata ; labellum subrotundatum, basi angustatum, 1·2 cm. diametro, purpureum nisi medio luteum (ex *Kerr*) ; filamentum latum, circiter 5 mm. longum ; anthera 8 mm. longa, calcare circiter 2 mm. longo.

Chiengmai, Doi Sootep, 660 m., *Kerr*, 1155 (leaf-specimens collected three weeks after flowering specimens).

Curcuma longa, *Linn.*—F.B.I., vi. p. 214 ; K. Schum., Engler Pflanzenr., Zingiber., p. 108 ; Fl. Indo-Chine, vi. p. 63.

Chiengmai, Doi Sootep, in damp evergreen jungle, 900 m., *Kerr*, 688.

Probably native in E. India or Indo-China—cultivated in the tropics.

Lao name, Kamin Pah (ex *Kerr*).

Curcuma parviflora, *Wall.*—F.B.I., vi. p. 215 ; Williams, Bull. Herb. Boiss., iv. (1904) p. 232 ; K. Schum., Engler Pflanzenr., Zingib., p. 102 ; Fl. Indo-Chine, vi. p. 61 ; Hosseus, ii. p. 373.

Chiengmai, Doi Sootep, in deciduous jungle, 300–720 m., *Kerr*, 719 ; Wang Djao, 100 m., *Hosseus*, 56.

Distr. Burma, [Laos, ex *Fl. Indo-Chine*, Siamese Malay Peninsula, ex *Williams*].

Curcuma zedoaria; *Roscoe*, forma, Hosseus, ii. p. 374.

Wang Djao, 140 m. (ex *Hosseus*).

Curcuma sp. aff. *C. sessili*, Gage.

Chiengmai, in deciduous jungle on lower slopes of Doi Sootep, 300–600 m., *Kerr*, 634.

According to Dr. Kerr the whole inflorescence is eaten by the natives.

Lao name, Dawk Aaow (ex *Kerr*).

Amomum siamense, *Craib*, sp. n., ab *A. Robertsonii*, Craib, foliis glabris distinguenda.

Caules ad 2·7 m. alti (ex *Kerr*), basi paulo ultra 2 cm. diametro, superne tantum foliati. *Folia* ad 79 cm. longa et 15·5 cm. lata, apice acuminata, acuta, basi in petiolum attenuata, utrinque glabra, subtus glaucescentia, petiolo 7 cm. longo suffulta ; ligulae omnes mancae, saltem 3 cm. longae ; vaginae glabrae, stramineae. *Spicae* radicales, densae, globosae vel ovoideae, ad 3 cm. longae, breviter pedunculatae ; bracteae exteriores subrotundatae, ad 2 cm. longae, interiores paulo angustiores, glabrae. *Calycis* extra parce pubescentis tubus 1 cm. longus, lobi lanceolati, acuti, cornuti, 1·3 cm. longi. *Corollae* albae (ex *Kerr*) tubus 2 cm. longus ; lobi oblongo-oblanceolati, acuti, ad 17 mm. longi et 6·5 mm. lati. *Staminodia* lateralia parva, dentiformia ; labellum album, luteo-maculatum (ex *Kerr*), 2·2 cm. longum, 7 mm. latum, intra parce pubescens ; anthera 7 mm. longa, filamento circiter 2 mm. longo. *Ovarium* 3 mm. altum, sericeum ; stylodia 6 mm. longa.

Chiengmai, in evergreen jungle on Doi Sootep, 1200–1650 m., *Kerr*, 597.

Zingiber (Cryptanthium) Bradleyanum, *Craib*, sp. n., ab affini *Z. barbato*, Wall., foliis latioribus subtus villosis bracteis angustioribus recedit.

Herba 58–63 cm. alta. *Folia* lanceolata vel oblongo-lanceolata, apice acuminata, acuta, basi attenuata, plerumque circiter 40 cm. longa et 6·5 cm. lata, fere sessilia, supra glabra, subtus villosa ; ligula bifida, 3 cm. longitudinis vix attingens, ad 5 mm. lata, viridis, parce pubescens ; vaginae infimae 2–3, ut superiores substrigosae. *Inflorescentia* e spicis 4 per paria lateraliter disposita superpositis constituta ; pedunculus spicae inferioris 2–4 cm. longus, superioris multo brevior, squamis imbricatis tectus ; spicae circiter 3–3·5 cm. longae ; bracteae dorso substrigosae, infimae 3 cm. longae ; bracteolae 23 mm. longae, 3 mm. latae. *Calyx* hyalinus, 9 mm. longus. *Corollae* albae (ex *Kerr*) tubus 3·7 cm. longus ; lobi oblongo- vel lineari-lanceolati, acuti, circiter 2·3 cm. longi, 3–7 mm. lati. *Staminodia* lateralia lobos laterales labelli simulantia ; labellum 1·8 cm. longum, 1·3 cm. latum ; anthera circiter 1 cm. longa, connectivi appendicula paulo longior.

Chiengmai, in rather damp, evergreen jungle on Doi Sootep, 300 m., *Kerr*, 763.

Zingiber (Lampujum) Kerrii, *Craib*, sp. n., ab affini *Z. officinali*, Roscoe, inflorescentia multo robustiore recedit.

Herba unimetralis vel paulo altior. *Folia* lineari-lanceolata, apice gradatim attenuata, acuta, basi in petiolum brevissimum strigosum attenuata, ad 31 cm. longa et 2 cm. lata, chartacea vel interdum rigide chartacea, utrinque glabra ; ligula ad 3 mm. longa, plerumque 2 mm. longa, superne strigosa ; vaginae pilis perpaucis instructae ; vaginae infimae 5–6, basales brunneae, ceterae virides. *Pedunculus* 8–11 cm. longus, squamis 6–8 superne gradatim majoribus extra tenuiter pilosis instructus ; spica fusiformis, ad 10 cm. longa, 3–3·5 cm. lata ; bracteae ad 3·3 cm. longae et 2·2 cm. latae, apice obtusae vel subrotundatae, superne rubro-brunneae, margine scariosae, uniflorae ; bracteolae late lanceolatae, acutiusculae, ad 2·7 cm. longae, vix 1 cm. latae, extra apice basique praecipue parce pubescentes. *Calyx* hyalinus, brunneo-striatus, 7 mm. longus, inferne pilosus. *Corollae* tubus circiter 3 cm. longus ; lobi parum inaequales, ad 1·7 cm. longi, 4 mm. lati. *Staminodia* oblonga, ad 9 mm. longa et 3 mm. lata, brunneo-lineata ; labellum suborbiculare, basi attenuatum, 1·1 cm. longum, 1 cm. latum ; anthera 7 mm. longa, connectivi appendiculae aequilonga. *Ovarium* 2·5 mm. altum.

Chiengmai, in evergreen and open jungle on Doi Sootep, 900–1200 m., *Kerr*, 1290.

Zingiber Parishii, *Hook. f.*—F. B. I., vi. p. 248 ; K. Schum., Engler Pflanzenr., Zingib., p. 173.

Chiengmai, Doi Sootep, in evergreen jungle, 660 m., *Kerr*, 1314.

Distr. Burma.

Zingiber (Cryptanthium) Smilesianum, *Craib*, sp. n., ab affini *Z. rubente*, Roxb., statura minore, foliis angustioribus distinguenda.

Herba 20–40 cm. alta. *Folia* lineari-lanceolata vel lanceolata, apice longe acuminata, acuta, basi in petiolum ad 5 mm. longum

attenuata, 9–20 cm. longa, 1·5–3·2 cm. lata, supra glabra, subtus tenuiter parce pilosa ; ligula oblonga, circiter 2 mm. longa, bifida ; vaginae infimae 4–5, ut superiores tenuiter parce pilosae. *Spicae* fusiformes vel ovoideae, 3–4 cm. longae, pedunculo brevi validiusculo subhorizontali vel ad 7 cm. longo tenuiore ascendente pauci-squamato suffultae ; bracteae oblongae vel late lanceolatae, exteriores ad 2·5 cm. longae, dorso tenuiter parce pilosae ; bracteolae ad 3·5 cm. longae, 3 mm. latae. *Calyx* 1·3 cm. longus, ima basi adpresse fulvido-pubescens. *Corollae* tubus circiter 3 cm. longus ; lobi lanceolati vel late lanceolati, acutissimi, ad 3 cm. longi et 6 mm. lati. *Staminodia* lobos laterales oblongos vix 1 cm. longos 1·5 mm. latos labelli formantia ; labellum ellipticum (apice retusum ?) circiter 2 cm. longum et 1·2 cm. latum ; anthera 1·2 cm. longa, connectivi appendiculam aequans. *Ovarium* 3·5 mm. altum, dense adpresse fulvido-hirsutum.

Chiengmai, Doi Sootep, on edge of evergreen jungle, 1200 m., *Kerr*, 1311 and in evergreen jungle, 1200–1500 m., *Kerr*, 1311 a.

Zingiber Zerumbet, *Roscoe ex Smith*—F.B.I., vi. p. 247 ; K. Schum., Engler Pflanzenr., Zingiber., p. 172 ; Fl. Indo-Chine, vi. p. 84.

Chiengmai, Doi Sootep, in mixed jungle, 330 m., *Kerr*, 1299.

Distr. Tropical Asia—often cultivated.

Costus speciosus, *Smith*, var. **argyrophyllus**, *Baker*, F.B.I., vi. p. 250. *C. speciosus*, var. *sericea*, K. Schum., Engler Pflanzenr., Zingib., p. 399.

Chiengmai, Doi Sootep, in damp places near streams, 300–900 m., *Kerr*, 775.

Distr. (of var.) Burma, Malaya.

Alpinia bracteata, *Roxb.*—F.B.I., vi. p. 255 ; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 136 ; K. Schum., Engler Pflanzenr., Zingiber., p. 336 ; Fl. Indo-Chine, vi. p. 95.

Chiengmai, in thick, damp, evergreen jungle on Doi Sootep, 900–1500 m., *Kerr*, 559 ; Doi Sootep, 1500 m., *Hosseus*, 508.

Distr. E. India, Indo-China.

Alpinia oxymitra, *K. Schum.*—K. Schum., Engler Pflanzenr., Zingiber., p. 336 ; Williams, Bull. Herb. Boiss., iv. (1904) p. 231.

Sriracha, Nawng Kaw, 30 m., *Kerr*, 2069 ; Koh Chang, *Schmidt*, 798.

Siamese name, Ton Lao (ex *Kerr*).

Alpinia siamensis, *K. Schum.*, Engler Pflanzenr., Zingiber., p. 357 ; Fl. Indo-Chine, vi. p. 100. *A. conchigera*, Williams, Bull. Herb. Boiss., iv. (1904) p. 231, in part.

Bangkok, *Schomburgk*, 123.

Distr. Cochinchina, Cambodia—ex *Fl. Indo-Chine.*

Alpinia sp. aff. *A. nutanti*, Roscoe.

Chiengmai, Doi Sootep, 1050 m., *Kerr*, 623.

Probably nearly allied also to *A. platychilus*, K. Schum. this plant may represent a new species.

Schumannianthus dichotomus, *Gagnep.*—Fl. Indo-Chine, vi. p. 122. *Clinogyne dichotoma*, Salisb.—F.B.I., vi. p. 258. *Donax Arundastrum*, K. Schum., Engler Pflanzenr., Marant., p. 33 ; Williams, Bull. Herb. Boiss., iv. (1904) p. 361, *vix* Lour.

Chiengmai, 300 m., cultivated, used for basket work, *Kerr*, 1857 ; Bangkok, *Schomburgk*, 130, *Zimmermann*, 46.

Distr. S. E. Asia.

Lao name, Dawk Yĕng (ex *Kerr*).

Donax arundastrum, Hosseus, ii. p. 374, may also be this plant.

Phrynium capitatum, *Willd.*—F.B.I., vi. p. 258, in part ; K. Schum., Engler Pflanzenr., Marant., p. 53 ; Williams, Bull. Herb. Boiss., iv. (1904) p. 361.

Chiengmai, Doi Sootep, on marshy ground in evergreen jungle, 660 m., *Kerr*, 1799.

Distr. India, China, Indo-China, Malay Archipelago.

Halopegia brachystachys, *Craib*, sp. n., ab *H. macrostachya*, K. Schum., bracteis multo minoribus facile distinguenda.

Herba circiter semimetralis. *Folia* oblonga vel late oblonga, apice abrupte acuminata, acuta, basi rotundata vel cuneato-rotundata, 12–21 cm. longa, 5·5–9 cm. lata, supra glabra, subtus parcissime pubescentia, petiolo ad 13 cm. longo parte suprema incrassata ad 1·3 cm. longa suffulta, vaginis strigosis et strigoso-ciliatis. *Inflorescentia* in vaginis inclusa, floribus (omnibus infeliciter mancis) albis (ex *Kerr*) tantum exsertis ; bracteae lanceolatae, acutae, 4·5 cm. longae, 7 mm. latae, utrinque glabrae ; flores gemini, breviter pedunculati, altero pedicello alato 5 mm. longo altero pedicello brevi haud alato suffulto. *Sepala* duo lanceolata, acuta, ad 4 mm. longa, dorso parce pubescentia, tertium minutum. *Ovarium* basi apiceque strigosum. *Caryopsis* cylindrica, 8 mm. longa, 3·5 mm. diametro, monosperma.

Meh Ping, Kampeng, in mixed jungle, *Kerr*, 2030.

To this species probably also belongs the plant collected in Rangoon by Scott which is included under *Phrynium spicatum* in the Flora of British India and under *Stachyphrynium spicatum* by K. Schumann in his monograph of the Marantaceae in Engler's Pflanzenreich. The writer has not seen the plant collected at Pahombuk by Hosseus and referred by him (ii. p. 374) to *Stachyphrynium spicatum*.

Iridaceae.

Iris Collettii, *Hook. f.* *I. nepalensis*, forma depauperata, Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 136.

Chiengmai, Doi Sootep, in deciduous jungle, 480–750 m., *Kerr*, 656.

Distr. Upper Burma, Yunnan.

Part of this collection is typical in having the leaves quite small at the flowering stage, whereas part—also in the flowering stage—has leaves up to 48 cm. long.

Amaryllidaceae.

Hypoxis aurea, *Lour.*—F.B.I., vi. p. 277 ; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 136 ; Williams, Bull. Herb. Boiss., iv. (1904) p. 230.

Chiengmai, Doi Sootep, among grass in open jungle, 1200–1500 m., *Kerr*, 1280.

Distr. S.E. Asia.

Curculigo gracilis, *Wall.*—F.B.I., vi. p. 278.
Chiengmai, Doi Sootep, in evergreen jungle, 900 m., *Kerr*, 1812.
Distr. E. Himalaya.

Curculigo latifolia, *Dryand.*—F.B.I., vi. p. 280; Hosseus, ii. p. 373.
Koh Yai (ex *Hosseus*).
Distr. India, Burma, Malaya.

Curculigo orchioides, *Gaertn.*—F.B.I., vi. p. 279.
Chiengmai, in mixed jungle at foot of Doi Sootep, 330 m., *Kerr*, 1195.
Distr. S. China to Australia.

Curculigo recurvata, *Dryand.*—F.B.I., vi. p. 279.
Chiengmai, Doi Sootep, in evergreen jungle by streams, 660 m., *Kerr*, 1176.
Distr. S. China to Australia.

Curculigo sp.
Chiengmai, in mixed jungle, 660 m., *Kerr*, 1873.

Crinum Wattii, *Baker*—F.B.I., vi. p. 281.
Chiengmai, Doi Sootep, in mixed jungle, 300–900 m., *Kerr*, 1844.
Distr. Manipur, Upper Burma.

Taccaceae.

Tacca Garrettii, *Craib*, sp. n., a *T. laevi*, Roxb., involucro multo majore e segmentis 4 quorum duobus aliis multo majoribus constituto recedit.

Folia anguste elliptica, apice acuminata, acuta, basi rotundata, ad 45 cm. longa et 18·5 cm. lata, chartacea, glabra, nervis lateralibus primariis circiter 12 subtus cum costa prominentibus supra conspicuis subprominulis, petiolo ad 45 cm. longo suffulta. *Pedunculus* 66 cm. longus, glaber. *Involucri* bracteae glabrae, majores 7 cm. longae et 8 cm. latae, minores 7 cm. longae, 3·5 cm. latae; bracteae filiformes, ad 20·5 cm. longae. *Pedicelli* 3–3·5 cm. longi, glabri. *Receptaculum* 7 mm. altum, subalatum. *Perianthii* tubus circiter 6 mm. longus; lobi exteriores oblongi, apice rotundati, circiter 11 mm. longi et 8 mm. lati; interiores exterioribus paulo majores.

Doi Intanon Range of the Pah Ngeam, 1230 m., in wet jungle among rotting wood, *Garrett*, 45.

Tacca laevis, *Roxb.*—F.B.I., vi. p. 288.
Chiengmai, Doi Sootep, in evergreen jungle by a stream, 690–900 m., *Kerr*, 1168, 1168a—"fruit lying on ground, underneath fallen leaves."
Distr. S.E. Asia.

Dioscoreaceae.*

Dioscorea alata, *Linn.*
Chiengmai, 300 m., in scrub jungle, *Kerr*, 1528a; Doi Sootep, 330 m., in scrub jungle, *Kerr*, 1528b.

* The specimens of *Dioscorea* have been kindly named for me by Mr I. H. Burkill who, with Sir D. Prain, is at present engaged on a monograph of the genus. Owing to the involved synonymy references to published works have been omitted.

Distr. India, Assam, Burma, Yunnan, Polynesia, Mascerene Is., West Tropical Africa.

Dioscorea birmanica, *Prain et Burkill.*
Chiengmai, in scrub jungle at foot of Doi Sootep, 330 m., *Kerr*, 1326.
Distr. Burma.

Dioscorea brevipetiolata, *Prain et Burkill.*
Sriracha, Nawng Kaw, edge of railway track, 30 m., *Kerr*, 2017.

Dioscorea bulbifera, *Linn.*
Chiengmai, in scrub jungle, 300 m., *Kerr*, 1529b ; near Muang Hawt, 225 m., *Kerr*, 2206 ; Phre, 156–240 m., *Luang Vanpruk*, 127.
Distr. Through India except the driest parts, Ceylon and eastwards to Tahiti reaching Japan northwards and entering Australia southwards. Probably only an introduction in other parts of the world (*e.g.*, Africa and W. Indies).
Lao name, Koii (ex *Kerr*).

Dioscorea daemona, *Roxb.*, var. **mollissima**, *Prain et Burkill.*
Chiengmai, in mixed jungle at foot of Doi Sootep, 300 m., *Kerr*, 681.
Distr. Through India except the dry parts of the North West, Ceylon and eastwards through southern China, Malaya to New Guinea ; var. *mollissima* in the Malay region only.

Dioscorea decipiens, *Hook. f.*
Chiengmai, Doi Sootep, in mixed jungle, 360 m., *Kerr*, 1449.
Distr. Burma, just entering Southern China and reaching Cochinchina.

Dioscorea glabra, *Roxb.*
Chiengmai, Doi Sootep, in scrub jungle, 330 m., *Kerr*, 1485.
Distr. From Orissa and Bengal eastwards to the Malay Islands.

Dioscorea kamoonensis, *Kth.*
Chiengmai, Doi Sootep, in open jungle, 1560 m., *Kerr*, 1374.
Distr. Along the Himalaya to South-Western China and thence southwards in a few ranges.

Dioscorea Kerrii, *Prain et Burkill.*
Chiengmai, *Kerr*, 1404.

Dioscorea membranacea, *Pierre.*
Chiengmai, Doi Sootep, in mixed jungle, 360 m., *Kerr*, 1245 ; Meh Hia, 330 m., in mixed jungle, *Kerr*, 1951.
Distr. Chin Hills, Cochinchina.

Dioscorea pentaphylla, *Linn.*
Chiengmai, Doi Sootep, 900 m., *Kerr*, 1383, 1383a.
Distr. India, except the Punjab, Ceylon and eastwards to Tahiti entering Southern China.

Dioscorea pentaphylla, *Linn.*, var. near var. *Jacquemontii.*
Chiengmai, Doi Sootep, in mixed jungle, 360 m., *Kerr*, 1450.
This variety is confined to Western India. *Kerr*, 1450 cannot be proved to be the same with the root and abundance of ♂ flowers.

Dioscorea pentaphylla, *Linn.*, var. **malaica.**

Chiengmai, in scrub jungle, 300 m., *Kerr*, 2251 ; Doi Sootep, in mixed jungle, 330 m., *Kerr*, 2251a.

Distr. (of *var.*). Malaya and perhaps in the Pacific.

Roxburghiaceae.

Stemona aphylla, *Craib*, sp. n., caulibus florigeris crassis, foliis ad bracteas squamoideas reductis, pedunculo communi brevi distincta.

Caules florigeri ad 4·5 mm. diametro, teretes, primo leves, mox striati, hic illic glaucescentes, glabri. *Folia*, saltem caulium florigerorum, ad squamas deltoideas acutas 7 mm. longitudinis et basi fere 7 mm. latitudinis attingentes glabras reducta. *Pedunculus* communis abbreviatus, squama brevior vel eam subaequans, glaber ; bracteae lanceolatae, acutae, ad 4·5 mm. longae, squamiformes, glabrae ; pedicelli plerumque circiter 1·5 cm. longi, glabri, medium prope articulati ; flores virides (ex *Kerr*). *Fl.* ♂. *Perianthii* segmenta 4, exteriora anguste oblonga, acuta, 2·5 cm. longa, 5·5 mm. lata, interiora oblongo-ovata, acuta, exterioribus subaequilonga, circiter 1 cm. lata. *Stamina* 4 ; filamenta brevia, basi breviter connata ; antherae (appendice inclusa) 21 mm. longae. *Ovarii* rudimentum parvum. *Fl.* ♀ (vel ☿ ?). *Perianthiium* masculi sed minus. *Stamina* 4, (fertilia ?). *Ovarium* 4 mm. altum, stylo obtuso vix distincto, ovulis pluribus erectis.

Near Phre, Me Ta, perennial with trailing shoots, roots numerous thick and fleshy, in dry bamboo jungle, 240 m., *Kerr*, 2351.

Stemona Burkillii, *Prain*, Journ. As. Soc. Beng., lxxiii. p. 43, *ex descr.*

Chiengmai, Doi Sootep, in evergreen jungle, 420 m., *Kerr*, 1403, in mixed jungle, 570 m., *Kerr*, 1403a.

Distr. Upper Burma (ex *Prain*).

Stemona Griffithiana, *Kurz*—F.B.I., vi. p. 299 ; Prain, Journ. As. Soc. Beng., lxxiii. p. 42.

Phre, Rawng Kwang, in deciduous jungle, 180 m., *Kerr*, 2365.

Distr. Burma.

Stemona Kerrii, *Craib*, sp. n., a *S. Curtisii*, Hook. f., foliis minoribus haud glabris facile distinguenda.

Herba erecta vel volubilis ; radices e rhizomate perenni fusiformes, ad 10 cm. longae, 7 mm. diametro ; caules breviter crispatim pubescentes, juventute gracillimi, si erecti flexuosi. *Folia* ovata vel late ovata, apice acuminata, acuta, basi cordata, plerumque altius cordata, 3-8 cm. longa, 2–6·3 cm. lata, basi plerumque 11-13-nervata, nervis lateralibus supra conspicuis subtus prominentibus, nervis transversis densis parallelis utrinque conspicuis, nervis nervulisque pagina superiore pilis albis parcissime instructa, inferiore piloso-pubescentia, sicco viridia ; petioli 0·7–3 cm. longi, supra canaliculati, indumento ut caules. *Inflorescentia* axillaris, 1–3-flora, petiolos subaequans, floribus polygamo-dioicis. *Fl.* ♂. *Perianthii* segmenta 4, lineari-lanceolata vel late lanceolata, acuta, 9 mm. longa, 2·25–3·25 mm. lata, extra pilis paucis rigidis erectis instructa, intra glabra. *Filamenta* brevissima, ima basi connata, ovarii rudimentum minutum cingentia ; antherae sicco subvirides, 2·25 mm. longae ; connectivi appendicula sicco rubra, inaequaliter trialata, alis

lateralibus 6 mm. longis utraque 0·75 mm. lata intra paulo supra alae mediae apicem corpusculo albido circiter 1 mm. longo ornatis ala media 1·75 mm. longa. *Fl.* ♂. *Perianthium staminaque* maris nisi paulo longiora. *Pistillum* glabrum, 2·5 mm. altum, ovulis 2 erectis.

Chiengmai, Doi Sootep, 720–900 m., erect or scandent on low herbage, *Kerr*, 707.

Liliaceae.

Smilax Hemsleyana, *Craib*, sp. n., a *S. lanceaefolia*, Roxb., foliis late ellipticis vel ovato-ellipticis distinguenda.

Ramuli straminei, striati vel minute striati, glabri, aculeis sparsissime instructi. *Folia* elliptica, late elliptica vel ovato-elliptica, apice breviter acuminata, basi truncato- vel rotundato-cuneata, 9–12 cm. longa, 6–9·5 cm. lata, glabra, rigide chartacea, 5-nervia, nervis cum nervulis pagina utraque prominulis, petiolo 1·5–2 cm. longo suffulta; vaginae petiolis 5–7 mm. adnatae. *Pedunculus* inflorescentiae ♀ 3·7 cm. longus, 8 mm. e basi bibracteatus, glaber; pedicelli circiter 8 mm. longi, glabri. *Perianthii* albi (ex *Kerr*) segmenta medio reflexa, exteriora suboblonga, apice cucullata, medio (ubi reflexa) parum angustata, 4·5 mm. longa, 2·25 mm. lata, interiora 4·5 mm. longa, basi 1 mm. lata, superne 0·75 mm. lata. *Staminodia* 3, filiformia, 2·5 mm. longa. *Ovarium* 3 mm. altum, glabrum. *Fructus* globosus, sicco substramineus, 7–8 mm. diametro.

Chiengmai, Doi Sootep, climbing over bushes in evergreen jungle by stream, 660 m., *Kerr*, 596.

Collett, 653 referred to by Coll. and Hemsl., Journ. Linn. Soc., xxviii. p. 137 under *S. lanceaefolia*, probably also belongs to this species.

Smilax lanceaefolia, *Roxb.*—F.B.I., vi. p. 308; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 137; Hosseus, ii. p. 373.

Chiengmai, Doi Sootep, in evergreen jungle, 1050–1350 m., *Kerr*, 522; Doi Intanon, 1300 m., *Hosseus*, 337.

Distr. Sikkim, Assam, Burma, China.

Smilax macrophylla, *Roxb.*—F.B.I., vi. p. 310; Hosseus, ii. p. 373.

Chiengmai, Doi Sootep, in mixed jungle, 330 m., *Kerr*, 1847.

Distr. India, Burma, Assam.

Smilax peguana, *A. DC.*—F.B.I., vi. p. 303.

Chiengmai, Doi Sootep, in evergreen jungle, 1050–1350 m., *Kerr*, 679.

Distr. Burma.

Smilax prolifera, *Roxb.*—F.B.I., vi. p. 312.

Chieng Kŭm, 390 m., *Kerr*, 2465.

Distr. India, Assam, Burma.

Lao name, Mai dao (ex *Kerr*).

Smilax sp.

Chiengmai, Doi Sootep, 300–750 m., *Kerr*, 632.

Smilax sp., *Hosseus*, ii. p. 373.

Chiengmai, Doi Sootep, 1675 m. (ex *Hosseus*).

Asparagus acerosus, *Roxb.*—F.B.I., vi. p. 317.

Chiengmai, cultivated, 300 m., *Kerr*, 2626—"said to have been brought from the jungle."

Distr. Bengal, Assam, Burma (N. Australia?).

Asparagus racemosus, *Willd.*—F.B.I., vi. p. 316; Williams, Bull. Herb. Boiss., iv. (1904) p. 230.

Sriracha, on rocks by beach, *Kerr*, 2096.

Distr. Trop. Asia, Australia and Africa.

Asparagus racemosus, *Willd.*, var. **subacerosa**, *Baker*—F.B I., vi. p. 317.

Chiengmai, 300 m., in scrub jungle, *Kerr*, 1961.

Distr. Sikkim.

Asparagus sp., *Hosseus*, ii. p. 373.

Doi Intanon, 1100 m. (ex *Hosseus*).

Disporopsis longifolia, *Craib*, sp. n., a speciebus adhuc descriptis foliis multo longioribus facile distinguenda.

Herba glabra, *Polygonati* speciebus facie persimilis; rhizoma repens, circiter 1 cm. diametro; caules solitarii vel bini, 33–107 cm. alti. *Folia* lanceolata vel late lanceolata, apice longe acuminata, acuta, basi cuneata vel rotundato-cuneata, 12–30 cm. longa, 2·6–5·2 cm. lata, nervis primariis 3–5 pagina utraque prominulis, secondariis conspicuis, petiolo brevi validiusculo suffulta. *Flores* in fasciculas ad 7-floras axillares dispositi; pedicelli ad 1·5 cm. longi, sulcati vel subalati. *Perianthii* albi (ex *Kerr*) tubus subglobosus, 3–4 mm. altus, lobi exteriores elliptico-lanceolati, acutiusculi, 7 mm. longi, 4·5 mm. lati, interiores exterioribus paulo breviores latioresque, apice rotundato-truncati vel fere truncati. *Corona* 1·75 mm. alta, paulo ultra medium lobata, lobis apice emarginatis. *Stamina* ad apices coronae loborum affixa, filamentis brevissimis; antherae dorsifixae, basi saccatim productae, 3 mm. longae. *Pistillum* corona occlusum; ovarium 3 mm. altum, stylo vix 2 mm. longo.

Chiengmai, in evergreen jungle on Doi Sootep, 960 m., *Kerr*, 687a; in evergreen jungle, 900 m., *Kerr*, 687.

Distr. S.W. China: Szemao, 1350–1800 m., *Henry*, 12,225, 12,225b, 12,225c; Lungchow, *Morse*, 603.

The description has been drawn up from *Kerr* 687a which is the type of the species and which agrees with Morse's plant and with part of Henry's. Part of Kerr 687 agrees with the type but part agrees with the remainder of Henry's plants in having shorter and relatively broader leaves which are not nearly so long acuminate.

D. longifolia differs from Hance's original plant in some important points besides the diagnostic character given above. The flowers are here arranged in axillary fascicles whereas in Hance's plant they are solitary. Again the structure of the corona is markedly different. In the original plant the lobes alternate with the stamens whereas here the stamens are situated at the apex of the lobes.

Ophiopogon brevipes, *Craib*, sp. n., ob racemum breviusculum validum subcernuum foliaque longiuscula angusta distincta.

Rhizoma repens, radices longiusculas satis crassas emittens. *Folia* rigidiuscula, sub anthesin circiter 20 cm. longa et 4 mm. lata, deinde in fructu ad fere 40 cm. longa et 7 mm. lata, petiolo circiter 4 cm. longo suffulta, pagina utraque glabra, inferiore nervis

prominulis, pallidiora, minute serrulata. *Racemi* sub anthesin 3·7 cm. longi, pedunculo crassiusculo circiter 5 cm. longo sulcato superne bracteis 4 sterilibus paleaceis instructo suffulti ; bracteae normales persistentes, infimae ovato-lanceolatae, acutae, 4 cm. longae, supremae gradatim minores, 2–3-florae ; pedicelli recurvi, 3·5 mm. longi, circiter medium articulati. *Perianthii* albi (ex *Kerr*) segmenta exteriora lineari-oblonga, vix 7 mm. longa et 2 mm. lata, interiora late lanceolata, exterioribus paululo latiora. *Filamenta* brevia, complanata ; antherae vix 3 mm. longae, connectivo producto. *Stylus* validiusculus, glaber, perianthio aequialtus.

Chiengmai, Doi Sootep, 660 m., *Kerr*, 1197, 1197a, 1840, 2609.

Ophiopogon gracilipes, *Craib*, sp. n., ob perianthii lobos reflexos, facie *Peliosanthis* speciebus similis distincta.

Folia oblongo-oblanceolata, utrinque acutata, 12–21 cm. longa, 1·5–3 cm. lata, chartacea, glabra, nervis primariis circiter 5 supra prominentibus subtus conspicuis vel prominulis, petiolis ad 15 cm. longis suffulta. *Racemi* laxiflori, circiter 8 cm. longi, pedunculo communi 3·5–8·5 cm. longo glabro sulcato bracteis pluribus sterilibus bracteis floriferis similibus superne gradatim minoribus instructo suffulti ; bracteae floriferae ovato-lanceolatae, plerumque arcuatae, ad 7 mm. longae, albidae ; pedicelli rigidi, decurvi, circiter 6 mm. longi, apicem versus articulati, glabri ; bracteola ovato-lanceolata, acuta, superne falcata, bractea conspicue minor. *Perianthii* albi (ex *Kerr*) segmenta exteriora lanceolata, acuta, 4 mm. longa, 1·5 mm. lata, interiora paululo longiora latioraque, apice subrotundata. *Filamenta* brevia, ima basi connata ; antherae circiter 2·5 mm. longae. *Ovarium* superum, in stylum gradatim fastigatum ; ovula in loculo quoque gemina, erecta, collateralia.

Chiengmai, Doi Sootep, in evergreen jungle, 660 m., *Kerr*, 1087.

Ophiopogon Malcolmsonii, *Royle ex Hook. f.*, F.B.I., vi. p. 269.
Chiengmai, Doi Sootep, by a stream, 720 m., *Kerr*, 1198.
Distr. Burma.

Dracaena sp.
Phre, 120–180 m., *Luang Vanpruk*, 152.

Chlorophytum intermedium, *Craib*, sp. n., a *C. orchidastro*, Lindl., foliis multo angustioribus, a *C. undulato*, Wall., floribus minoribus, pedicellis brevioribus recedit.

Herba 0·5–1 m. alta ; radices satis crassae, elongatae. *Folia* ad 58 cm. (petiolo incluso) longa et 2·2 cm. lata, apice acuta, basi in petiolum vix distinctum attenuata, petiolo basi expanso pedunculum amplectente, nervis primariis pagina utraque prominulis. *Racemi* solitarii, vel simplices vel inferne tantum furcati, pedunculo communi folia saepissime subaequante superne bractea sterili lanceolata vel lineari-lanceolata acuta 1·5–6·5 cm. longa instructo ; bracteae normales lanceolatae vel ovato-lanceolatae, acutae, 0·4–1 cm. longae ; pedicelli 7 mm. longi. *Perianthii* albi (ex *Kerr*) segmenta lineari-lanceolata, obtusiuscula, inter se subaequalia, circiter 8 mm. longa, 1·5 mm. lata. *Filamenta* 4 mm. longa, quam antherae basi bilobae paulo breviora. *Ovarium* 1·5 mm. altum, loculis 4-ovulatis ; stylus 8 mm. longus.

Chiengmai, in deciduous jungle on Doi Sootep, 450–750 m., *Kerr*, 773.

Chlorophytum simplex, *Craib*, sp. n., racemis laxis simplicibus folia lata plerumque paululo excedentibus, floribus majusculis distinguenda.

Herba 18–34 cm. alta, glabra ; radices satis crassae, anguste fusiformes, ad 16 cm. longae, circiter 4 mm. diametro. *Folia* plerumque oblongo-lanceolata, apice subacuminata, acuta, basi in petiolum plus minusve distinctum contracta, 14–30 cm. (petiolo incluso) longa, 2·5–4 cm. lata, nervis primariis subtus prominentibus supra conspicuis vel prominulis, petiolis basi in vaginam expansis pedunculum amplectentibus. *Racemi* solitarii, simplices, circiter 15 cm. longi, pedunculo communi racemo subaequali suffulti ; bracteae 1–3 infimae plerumque steriles, anguste lanceolatae, acutae, 1·5 cm. longae ; bracteae fertiles plerumque 3–florae ; pedicelli sub anthesin circiter 3 mm. longi, fructescentes paululo incrassati elongatique ; alabastra ambitu plus minusve oblongo - ovata, obtusa. *Perianthii* segmenta alba (ex *Kerr*), inter se subaequalia, linearia vel lineari-oblonga, apice obtusiuscula, vix 1 cm. longa, 2 mm. lata. *Filamenta* circiter 4 mm. longa, ut antherae, superne praecipue, minute papillosa ; antherae 6 mm. longae, basi bilobae. *Ovarium* 1·5 mm. altum, trigonum ; stylus 9 mm. longus ; loculi 4-ovulati. *Fructus* 5 mm. altus, 7 mm. latus.

Muang Hawt, in deciduous jungle, 210 m., *Kerr*, 2204.

Anthericum sp., *Hosseus*, ii. p. 373.
Wang Djao, 150 m. (ex *Hosseus*).

Dianella ensifolia, *Redouté*—F.B.I., vi. p. 347. *D. sp.*, Hosseus, ii. p. 373.
Chiengmai, Doi Sootep, 750–1400 m., *Kerr*, 1319, *Hosseus*, 456.
Distr. Tropical Asia and Australia, Mascerene Is.

Urginea indica, *Kunth*—F.B.I., vi. p. 347.
Chiengmai, Doi Sootep, in deciduous jungle, 330–450 m., *Kerr*, 1754, 1754a, 1754b.
Distr. India, Burma.

Lilium nepalense, *D. Don*—F.B.I., vi. p. 350 ; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 138.
Chiengmai, Doi Sootep, in open grassy jungle along tops of ridges, 1260–1560 m., *Kerr*, 734. Also flowered in Hort. Trin. Coll., Dublin in August this year.
Distr. Himalaya, Upper Burma.

Iphigenia indica, *Kunth*—F.B.I., vi. p. 357.
Chiengmai, Doi Sootep, among grass in an open spot, 600 m., *Kerr*, 752.
Distr. India to Australia.

Disporum calcaratum, *Don*—F.B.I., vi. p. 359 ; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 139. *D. latipetalum*, Coll. et Hemsl., l.c., p. 139.
Chiengmai, Doi Sootep, among grass in open jungle on ridges, 1350–1500 m., *Kerr*, 672 and in deciduous jungle, 720–900 m., *Kerr*, 693.
Distr. Himalaya, Assam, Burma, Yunnan.

Disporum pullum, *Salisb.*—F.B.I., vi. p. 360.

Chiengmai, Doi Sootep, in evergreen jungle, 1500–1650 m., *Kerr*, 617.

Distr. Himalaya to China, Assam, Malay Archipelago.

Paris polyphylla, *Smith*—F.B.I., vi. p. 362; Coll. et Hemsl. Journ. Linn. Soc., xxviii. p. 139.

Chiengmai, Doi Sootep, in open grassy jungle, 1380 m., *Kerr*, 1189.

Distr. Himalaya to China.

Pontederiaceae.

Monochoria hastata, *Solms*—Williams, Bull. Herb. Boiss., iv. (1904) p. 229; Hosseus, i. p. 471. *M. hastaefolia*, Presl.—F.B.I., vi. p. 362.

Chiengmai moat, 300 m., *Kerr*, 1361—"eaten as vegetable."

Distr. S.E. Asia.

Lao name, Puk tope (ex *Kerr*).

Monochoria vaginalis, *Presl.*—F.B.I., vi. p. 363; Hosseus, i. p. 471 et ii. p. 372.

Doi Intanon, 1095 m., *Garrett*, 58; Wang Djao, 100 m. and Doi Sootep, 1050 m. (ex *Hosseus*).

Distr. S.E. Asia, Tropical Africa.

Garrett's plant is referable rather to the variety *plantaginea*, Solms-Laubach.

Xyridaceae.

Xyris pauciflora, *Willd.*—F.B.I., vi. p. 365; Williams, Bull. Herb. Boiss., iv. (1904) p. 228; Hosseus, i. p. 468 et ii. p. 371.

Ban Meh Kah, above Meh Ping Rapids, in open marshy ground, 195 m., *Kerr*, 913; Wang Djao, *Lindhard*, 20, *Hosseus*, 118.

Distr. S.E. Asia to Australia.

Xyris pauciflora, *Willd.*, var.

Doi Intanon, 2150–2170 m., *Garrett*, 69.

Xyris schoenoides, *Mart.*—F.B.I., vi. p. 365.

Chiengmai, Doi Sootep, in open grassy jungle, 1350–1500 m., *Kerr*, 1503.

Distr. India, Khasia.

Commelinaceae.

Pollia Aclisia, *Hassk.*—F.B.I., vi. p. 367.

Chiengmai, Doi Sootep, in evergreen jungle by stream, 1260 m., *Kerr*, 1288.

Distr. Himalaya, Assam, Burma, China, Tonkin, Java.

Pollia thyrsiflora, *Hassk.*—F.B.I., vi. p. 367; Hosseus, i. p. 468.

Klong Sarlakpet (ex *Bot. Tidsskr.*, xxvi. p. 164).

Distr. S. Andamans, Borneo, Celebes, Philippines.

Commelina benghalensis, *Linn.*—F.B.I., vi. p. 370.

Chiengmai, 300 m., *Kerr*, 1344—"a garden weed."

Distr. Trop. Asia and Africa.

Commelina nudiflora, *Linn.*—F.B.I., vi. p. 369; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 139.

Chiengmai, Doi Sootep, by open streams, 330 m., *Kerr*, 1251.
Distr. Tropics and subtropics.

Commelina obliqua, *Ham.*—F.B.I., vi. p. 372 ; Hosseus, i. p. 469 et ii. p. 372.
Chiengmai, in open grassy jungle on Doi Sootep, 900–1200 m., *Kerr*, 1292 ; Wang Djao, Koh Yai, 110 m., *Hosseus*, 93.
Distr. Tropical Asia.
Part of *Kerr* 1292 is referable to *f. viscida*, Clarke.

Commelina salicifolia, *Roxb.*—F.B.I., vi. p. 370 ; Hosseus, i. p. 469.
Bangkok (ex *Hosseus*).
Distr. India, Assam.

Commelina spp.
Chiengmai, on mud bank of Meh Ping, 300 m., *Kerr*, 850 ; Doi Sootep, in evergreen jungle, 1050–1500 m., *Kerr*, 1289.

Aneilema bracteatum, *O. Kze. A. nudiflorum*, var. *bracteatum*, C. B. Clarke—Williams, Bull. Herb. Boiss., iv. (1904) p. 229 ; Hosseus, i. p. 470.
Chiengmai, Doi Sootep, in mixed jungle, 330 m., *Kerr*, 1458 ; Bangkok, *Schomburgk*, 329.
Distr. Annam (ex *O. Kze.*).

Aneilema clandestinum, *Ridley*.
Chiengmai, Doi Sootep, edge of stream in evergreen jungle, 660 m., *Kerr*, 1615 b.
Distr. Perak.

Aneilema discretum, *Craib*, sp. n., ab *A. divergente*, C. B. Clarke, inflorescentiae ramulis alternis nunquam oppositis nec verticillatis, ab *A. scapiflorae*, var. *latifolia*, N. E. Brown, habitu robusto, pedunculo communi haud aphyllo recedit.

Folia 15–30 cm. longa, circiter 2·5 cm. lata, apice acuta, inferne sensim angustata, dein in vaginam ampliata, supra marginem undulatum cartilagineum secus lineis paucis pilorum ornata, praeterea glabra, subtus subglabra, chartacea, nervis primariis paucis pagina superiore prominulis inferiore vix conspicuis. *Pedunculi* a foliis discreti, decumbentes, saepe nodis inferioribus radicantes, ad 80 cm. longi, pilis ascendentibus hirsutuli, sicco canaliculati, ima basi vaginis duobus dein foliis 6 supremis ad vaginam meram reductis instructi ; folia infima limbo circiter 10 cm. longo foliis normalibus simili basi in vaginam pedunculum laxe includentem eunte ; vaginae supremae circiter 1 cm. longae. *Panicula* circiter 7 cm. longa et 1·5 cm. diametro, staminibus exceptis glabra ; rami secundi, infimi ad 1·5 cm. longi ; bracteae ad ramorum bases brunneae, basi rachin cingentes, ad 3 mm. longae ; bracteae normales similes sed minores ; flores albi, vespere expansi (ex *Kerr*). *Sepala* 7 mm. longa, apice cucullata. *Petala* sepalis parum breviora. *Filamenta* inferne dense villosa ; antherae versatiles, 2 mm. longae. *Ovarium* 2 mm. altum, stylo 5 mm. longo. *Capsula* ad 7 mm. longa, pedicello 7 mm. longo suffulta, valvis apice cuspidatis, seminibus vix maturis.
Chiengmai, Doi Sootep, in mixed jungle, 330 m., *Kerr*, 1909.

Aneilema divergens, *C. B. Clarke*—F.B.I., vi. p. 376 ; Hosseus, i. p. 469.

Chiengmai, Doi Sootep, in eng jungle, 420 m., *Kerr*, 1315; Doi Saket (ex *Hosseus*).

Distr. Himalaya, Khasia, S. China.

Aneilema esculentum, *Wall.*—F.B.I., vi. p. 377; Hosseus, i. p. 469 et ii. p. 371.

Chiengmai, Doi Sootep, 350–1200 m. (ex *Hosseus*).

Distr. S. India, Ceylon.

Aneilema giganteum, *R. Br.*—F.B.I., vi. p. 379; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 140; Hosseus, i. p. 469 et ii. p. 371.

Wang Djao, 100 m., *Hosseus*, 75.

Distr. Trop. Asia, N. Australia, Africa.

Aneilema herbaceum, *Wall.*—Hosseus, i. p. 469 et ii. p. 372.

Doi Saket (ex *Hosseus*).

Aneilema Loureirii, *Hance*—F.B.I., vi. p. 375; Williams, Bull. Herb. Boiss., iv. (1904) p. 228; Hosseus, i. p. 470 et ii. p. 372.

Chiengmai, Doi Sootep, 660 m., *Kerr*, 1177.

Distr. S. China, Burma.

Aneilema nudiflorum, *Br.*—F.B.I., vi. p. 378.

Chiengmai, among pasture grass, 300 m., *Kerr*, 849; Doi Sootep, on damp rocks by stream, 720 m., *Kerr*, 1419.

Distr. S. E. Asia.

Aneilema scaberrimum, *Kunth*—F.B.I., vi. p. 382.

Chiengmai, Doi Sootep, 1650 m., in evergreen jungle, *Kerr*, 1508.

Distr. Nepaul to Khasia, Yunnan, Philippines, S. India.

Aneilema scapiflorum, *Wight*—F.B.I., vi. p. 375; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 140.

Chiengmai, Doi Sootep, 330–660 m., *Kerr*, 1786—"flowers blue, opening in morning only."

Distr. India, Burma, Philippines.

Aneilema siamense, *Craib*, sp. n., *A. Thomsoni*, C. B. Clarke, facie similis sed nodis radicantibus, foliis haud scabris, ovario subgloboso distinguenda.

Caules juventute parce hirsutuli, mox glabri, nodis basalibus radicantes. *Folia* elliptica, anguste elliptica vel oblanceolata, apice acuminata, acuta, basi in petiolum attenuata, 11–13 cm. longa, 3·5–4·8 cm. lata, utrinque glabra, chartacea, nervis primariis supra subconspicuis vel fere obscuris subtus prominulis, petiolo 1–2·5 cm. longo inferne subtus parce hirsutulo suffulta; vaginae circiter 2 cm. longae, extra parce hirsutulae. *Paniculae* pedunculo circiter 7 cm. longo medio bracteato suffultae; rachis, rami et pedunculus parce hirsutuli; rami infimi subverticillati et alterni, supremi alterni, erecto-patentes, 2 cm. longitudinis vix attingentes; bracteae ad ramorum bases sub anthesin arcte reflexae, lanceolatae, acutiusculae, ad 1·2 cm. longae et 2·5 mm. latae. *Sepala* elliptico-obovata, 3·5 mm. longa, 3 mm. lata. *Petala* alba (ex *Kerr*), sepalis subaequalia. *Filamenta* petalis subaequilonga, glabra. *Ovarium* subglobosum, vix 1·5 mm. altum, stylo 6·5 mm. longo.

Sriracha, Nawng Kaw, in evergreen jungle, 30 m., *Kerr*, 2064.

Aneilema sinicum, *Lindl.*—F.B.I., vi. p. 379.

Chiengmai, Doi Sootep, in open jungle, 750–1500 m., *Kerr*, 702 —"flowers open after mid-day."
Distr. S. E. Asia, Trop. Africa.

Aneilema spiratum, *R. Br.*—F.B.I., vi. p. 377; Williams, Bull. Herb. Boiss., v. (1905) p. 960; Hosseus, i. p. 470 et ii. p. 372.
Wang Djao, near Tapotsah, *Lindhard*, 75.
Distr. S. E. Asia.

Cyanotis axillaris, *R. et S.*—F.B.I., vi. p. 388; Williams, Bull. Herb. Boiss., iv. (1904) p. 229; Hosseus, i. p. 470 et ii. p. 372.
Chiengmai, by edge of paddy fields, 300 m., *Kerr*, 801; Wang Djao, *Hosseus*, 171a.
Distr. India and China to Australia.

Cyanotis barbata, *Don*—F.B.I., vi. p. 385; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 140.
Chiengmai, Doi Sootep, on rocks by stream, 600 m., *Kerr*, 1429.
Distr. Himalaya, Assam, Burma, China, Malay Peninsula.

Cyanotis capitata, *C. B. Clarke.*
Chiengmai, Doi Sootep, creeping on damp rocks by a stream, 720 m., *Kerr*, 1416.
Distr. Cochinchina, Philippines, Java, New Guinea.

Cyanotis cristata, *R. et S.*—F.B.I., vi. p. 385; Williams, Bull. Herb. Boiss., iv. (1904) p. 229; Hosseus, i. p. 470 et ii. p. 372.
Chiengmai, 300 m., *Kerr*, 1441, "a garden weed"; Doi Sootep, 300–600 m., in eng jungle, *Kerr*, 756; bank of Meh Ping, near Raheng, 120 m., *Kerr*, 504; Wang Djao, *Hosseus*, 72; near Tapotsah, *Lindhard*, 28; Cape Liant, *Murton*, 31.
Distr. Trop. Asia, Africa, Mascerene Is.
Of the specimens quoted probably *Kerr*, 1441, comes nearest to typical *C. cristata*.

Cyanotis nobilis, *Hassk.* *C. barbata*, Don, *f. nobilis*, C. B. Clarke—F.B.I., vi. p. 386.
Chiengmai, Doi Sootep, prostrate among rocks in open jungle, 1350–1500 m., *Kerr*, 703.
Distr. Khasia, China.

Floscopa scandens, *Lour.*—F.B.I., vi. p. 390; Hosseus, i. p. 471 et ii. p. 372.
Chiengmai, Doi Sootep, by stream, 690 m., *Kerr*, 1493; Pitsanulok, Nakontai, 300 m., *Kerr*, 722.
Distr. S.E. Asia, Australia.

Streptolirion volubile, *Edgew.*—F.B.I., vi. p. 389.
Doi Intanon, 2070 m., *Garrett*, 78.
Distr. Himalaya, Assam, Burma, China.

Palmeae.*

Wallichia caryotoides, *Roxb.*—F.B.I., vi. p. 419.
Chiengmai, Doi Sootep, in evergreen jungle by stream, 900 m., *Kerr*, 1513.

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* For the identifications of the specimens of this family the writer is indebted to Dr. O. Beccari, whose researches in this group are well known.

Distr. Bengal, Assam, Burma.
Lao name, Keuang (ex *Kerr*).

Didymosperma caudata, *Wendl. et Drude*—Beccari, Webbia, iii. p. 201 et Bull. Mus. Nat. d'Hist. Nat., 1911, p. 155.
Sriracha, Nawng Kaw, 30 m., in evergeen jungle, *Kerr*, 2077.
Frequent throughout Indo-China (ex *Beccari*).
Siamese name, Mai tan (ex *Kerr*).

Licuala spinosa, *Wurmb.*—F.B.I., vi. p. 431; Beccari, Webbia, iii. p. 240 et Bull. Mus. Nat. d'Hist. Nat., 1911, p. 157.

Sriracha, Nawng Kaw, in damp evergreen jungle, 30 m., *Kerr*, 2089.
Distr. Andaman and Nicobar Islands, Malaya.
Siamese name, K'Paw (ex *Kerr*).

Calamus Kerrianus, *Beccari*, sp. n., Ann. Roy. Bot. Gard. Calc., xi. suppl., p. 83.
Chiengmai, Doi Sootep, climbing on trees in evergreen jungle, 960 m., *Kerr*, 1618b.
Lao name, Wai (ex *Kerr*).

Calamus viminalis, *Willd.*, var. **fasciculatus**, *Beccari*, F.B.I., vi. p. 444 et Ann. Roy. Bot. Gard. Calc., xi. p. 206, t. 57.
Sriracha, in scrub and evergreen jungle, 15 m., *Kerr*, 2115.
Distr. India, Indo-China, Malay Peninsula.

Plectocomia khasyana, *Griff.*—F.B.I., vi. p. 478.
Chiengmai, Doi Sootep, in dense evergreen jungle, 1260 m., *Kerr*, 1817.
Distr. Khasia.

Pandanaceae.

Pandanus (Acrostigma) distans, *Craib*, sp. n. ab affini *P. Pierrei*, Martelli, syncarpiis duobus spicatis distantibus haud ad pedunculi apicem confertis recedit.

Frutex humilis, trunco 5–8 cm. tantum longo (ex *Kerr*). *Folia* 190–215 cm. longa, ad 2·3 cm. lata, dorso medio marginibusque aculeata. *Syncarpia* duo, spicata, circiter 6 cm. distantia, ellipsoidea vel ellipsoideo-globosa, 5 cm. lata, 6 cm. alta; drupae 17 mm. longae, 5 mm. diametro, stylo acuto 8 mm. longo.
Between Phre and Nan, Hue Me Sa Kawn, in evergreen jungle, 420 m., *Kerr*, 2386.

Pandanus furcatus, *Roxb.*—F.B.I., vi. p. 484; Warburg, Engler Pflanzenr., Pandan., p. 75.
Chiengmai, Doi Sootep, in evergreen jungle by stream, 900 m., *Kerr*, 1830.
Distr. Himalaya, Burma, Assam, Chittagong.

Pandanus (Acrostigma) similis, *Craib*, sp. n., a *P. ovato*, Kurz, foliis multo longioribus latioribusque recedit.
Suffrutex circiter 30 cm. altus (ex *Kerr*). *Folia* paulo ultra 1 m. longa, 1·5–1·8 cm. lata, margine spinulosa, costa dorso inferne spinis rigidiusculis rectis circiter 1·5 mm. longis inter se 1·3–1·5 cm. distantibus superne spinulis prorsus directis instructa praetereaque supra spinulis prorsus directis in lineas duas dispositis additis. *Syncarpium* solitarium, vix maturum, late ellipsoideum, circiter

2·5 cm. diametro, pedunculo triquetro circiter 10 cm. longo suffultum; drupae siccae apice subtruncatae, 9 mm. altae, apice 5 mm. diametro, laeves, stylo spinoso 5 mm. longo terminatae.

Sriracha, Nawng Kaw, in evergreen jungle, 30 m., *Kerr*, 2068.

Araceae.

Arisaema album, *N. E. Brown*—F.B.I., vi. p. 498.

Chiengmai, Doi Sootep, on humus in evergreen jungle by a stream, 750 m., *Kerr*, 640.

Distr. Khasia.

A closely allied species was collected by *Murton* (No. 115) in S. Siam which has a broader spathe suddenly contracted at the top and not gradually as in *A. album* and the tip of the spathe much shorter.

Arisaema consanguineum, *Schott*—F.B.I., vi. p. 505.

Chiengmai, Doi Sootep, in evergreen jungle, 1200–1500 m., *Kerr*, 1874, in part.

Distr. Himalaya to China, Assam.

Arisaema hypoglaucum, *Craib*, sp. n., ab affini *A. erubescente*, Schott, foliorum segmentis longis subtus glaucis distinguenda.

Herba dioica, 45–70 cm. alta, tubere depresso-globoso. *Folia* solitaria, radiatisecta, petiolo 25–30 cm. longo suffulta; segmenta 7, lanceolata, apice caudato-acuminata, basi cuneata, 23–35 cm. longa, 4·5–7 cm. lata, subsessilia, glabra, subtus glauca, nervis lateralibus utrinque numerosis supra conspicuis subtus subprominulis, nervo intramarginali supra conspicuo, margine integro. *Scapus* folio brevior. *Spathae* pars tubulosa vix 4 cm. longa, limbus anguste ellipticus, caudato-acuminatus, 8 cm. longus, 3·5 cm. latus, basi auriculatus. *Spadix* ♀ sessilis; stigma sessile; appendix validiuscula, 4 cm. longa, basi 3 mm. diametro, inferne fimbriis paucis ornata.

Chiengmai, in evergreen jungle on Doi Sootep, 1200–1500 m., *Kerr*, 1874, in part.

Arisaema Kerrii, *Craib*, sp. n., ab affini *A. fraterno*, Schott, spatha appendice longa gracili instructa recedit.

Herba dioica, circiter 40 cm. alta. *Folia* solitaria, radiatisecta, petiolo maculato circiter 14·5 cm. longo suffulta; segmenta 6, lanceolata, apice acuminata, acumine lineari circiter 5 mm. longo, basi attenuata, 10 cm. longa, 1·7–fere 2 cm. lata, sessilia, glabra, nervis lateralibus cum nervo intramarginali supra subconspicuis. *Spathae* pars tubulosa 4 cm. longa, 1 cm. diametro, limbus 3·8 cm. longus, 3·3 cm. latus, cauda gracili ad fere 15 cm. longa ornatus. *Spadicis* pars antherifera 1·5 cm. longa, 2 mm. diametro; appendix superne arcuata, summo apice 4 mm. diametro, imo basi 1·5–2 mm. crassa.

Chiengmai, in evergreen jungle on Doi Sootep, 1200 m., *Kerr*, 620.

Arisaema sootepense, *Craib*, sp. n., ab affini *A. Prazeri*, Hook. f., foliorum segmentis angustioribus longioribus tenuioribus recedit.

Herba dioica, 40–55 cm. alta, tuberosa, tubere depresso-globoso 2 cm. alto 2·4 cm. lato. *Folia* solitaria, trisecta, petiolo 11–19 cm. longo suffulta; segmenta ovato-lanceolata vel anguste elliptica,

apice acuminata, acuta, basi cuneata vel latere altero rotundato-cuneata, altero rotundata, lateralia inaequilatera, 10·5–15 cm. longa, 4–6 cm. lata, subsessilia, glabra, nervis lateralibus cum nervo intramarginali supra conspicuis subtus prominulis, nervulis subtus conspicuis. *Spathae* pars tubulosa circiter 3·5 cm. longa, 1 cm. diametro, limbus apice acutus, ad 7·5 cm. longus et 3 cm. latus. *Spadix* breviter stipitata ; pars antherifera 1·5 cm. longa ; appendix ad 27 cm. longa, apice filiformis, gracilis, pendula.

Chiengmai, Doi Sootep, 660 m., *Kerr*, 1199.

Typhonium trilobatum, *Schott*—F.B.I., vi. p. 509 ; Williams, Bull. Herb. Boiss., iv. (1904) p. 227 ; Hosseus, i. p. 467.

Chiengmai, 300 m., *Kerr*, 1859—" a garden weed " ; Bangkok, *Schomburgk*, 334.

Distr. India, Burma, Malaya, Tonkin, Philippines.

Amorphophallus corrugatus, *N. E. Brown*, Kew Bull. 1912, p. 269.

Chiengmai, Doi Sootep, 1500 m., *Kerr*, 1105 ; cult. Hort. Trin. Coll., Dublin.

Amorphophallus Kerrii, *N. E. Brown*, Kew Bull. 1912, p. 43.

Cult. Hort. Trin. Coll., Dublin, whence it was sent by Dr. Kerr from Chiengmai.

Amorphophallus macrorhizus, *Craib*, sp. n., ab affini *A. variabili*, Blume, radice elongata, foliorum segmentis majoribus distinguenda.

Radix ad 6 cm. longa, apice circiter 1 cm. diametro. *Folia* solitaria, petiolo 36–80 cm. longo viridi rubro-brunneo-maculato (ex *Kerr*) suffulta ; lamina trisecta, segmentis simplicibus bisectis pinnatisectis vel furcatis et pinnatisectis ; segmenta ultima inferiora obovata, apice acuminata, acuta, basi cuneata, circiter 8 cm. longa et 4 cm. lata, terminalia oblongo-elliptica, apice acuminata, acuta, basi inaequilatera, decurrentia, ad 24 cm. longa et 9 cm. lata, supra glabra, viridia, subtus nervis minute papilloso-puberula, pallidiora, nervis lateralibus utrinque numerosis rectis vel subrectis cum nervo intramarginali supra conspicuis subtus subprominulis, chartaceo-membranacea. *Pedunculus* 52–87 cm. longus, rubro-brunneo-ocellatus (ex *Kerr*). *Spatha* erecta, 13·5–18 cm. longa, 5 cm. lata, acuta, basi convoluta. *Spadix* sessilis ; pars feminea 2–3·5 cm. longa, 0·6–1·2 cm. crassa, stigmate sessili ; pars antherifera 4·5–6 cm. longa, 1–1·6 cm. crassa ; appendix 19 cm. longa, 7 mm. diametro, basi fimbriis paucis interdum ornata.

Chiengmai, in mixed jungle at foot of Doi Sootep, 330 m., *Kerr*, 1220, 1220a.

To this species probably also belongs *Kerr*, 1140 from the same locality at 660 m. elevation.

Remusatia vivipara, *Schott*—F.B.I., vi. p. 521.

Chiengmai, Doi Sootep, on trees and rocks, 660 m., *Kerr*, 1438.

Distr. India, Khasia, Burma.

Gonatanthus sarmentosus, *Klotzsch*—F.B.I., vi. p. 522 ; Hosseus, i. p. 467 et ii. p. 371.

Chiengmai, Doi Sootep, on trees in evergreen jungle, 1500–1680 m., *Kerr*, 1487, *Hosseus*, 254.

Distr. Himalaya, Khasia.

Kerr's plant has leaves more after those of *G. ornatus*, Schott.

Acorus Calamus, *Linn.*—F.B.I., vi. p. 555 : Hosseus, i. p. 467 et ii. p. 371 ; Engler, Engler Pflanzenr., Arac.–Pothoid., p. 309.
Chiengmai, Doi Sootep, on stones in stream in evergreen jungle, 900 m., *Kerr*, 2593.
Distr. Europe, Asia, America—often naturalised.

Colocasia Antiquorum, *Schott*—F.B.I., vi. p. 523.
Chiengmai, Doi Sootep, 720 m., *Kerr*, 742.
Commonly cultivated in the tropics and subtropics.

Hapaline Benthamiana, *Schott*— F.B.I., vi. p. 521.
Chiengmai, Doi Sootep, 720 m., *Kerr*, 614.
Distr. Burma.

Aglaonema Hookerianum, *Schott*—F.B.I., vi. p. 529.
Chiengmai, Doi Sootep, in evergreen jungle, 900 m., *Kerr*, 1160, in part.
Distr. Assam, Chittagong, Arracan.

Aglaonema malaccense, *Schott*. *A. Schottianum*, Hook. f., F.B.I., vi. p. 529, in part.
Chiengmai, Doi Sootep, in evergreen jungle, 900 m., *Kerr*, 1160, in part.
Distr. Burma, Malay Peninsula.
The writer cannot follow Williams and Hosseus in regarding *A. malaccense*, Schott and *A. Schottianum*, Miq. as synonymous.

Aglaonema sp., an *A. tenuipes*, Engler ?
Sriracha, Nawng Kaw, in evergreen jungle, 30 m., *Kerr*, 2070.
Differs from Engler's description in the slightly smaller leaves and the longer peduncle, but Kerr's specimens are in fruit, whereas those described by Engler were in flower.

Homalomena aromatica, *Schott*—F.B.I., vi. p. 532.
Chiengmai, Doi Sootep, in marshy ground, 660 m., *Kerr*, 1864.
Distr. Assam.

Rhaphidophora glauca, *Schott*, var. **khasiana**, *Hook. f.*, F.B.I., vi. p. 547 ; Engler, Engler Pflanzenr., Arac.-Monsteroid., p. 47.
Chiengmai, Doi Sootep, in evergreen jungle, 200 m., *Kerr*, 1813.
Distr. Khasia.

Pothos Cathcartii, *Schott*—F.B.I., vi. p. 552 ; Engler, Engler Pflanzenr., Arac.–Pothoid., p. 27.
Chiengmai, Doi Sootep, on trees in thick evergreen jungle, 1200–1650 m., *Kerr*, 1872.
Distr. Himalaya, Assam, Burma, Yunnan.

Pothos scandens, *Linn.*, forma **angustior**, Engler—Engler, Engler Pflanzenr., Arac.–Pothoid., p. 26.
Sriracha, Nawng Kai Ploi, common on trees in evergreen jungle, 90 m., *Kerr*, 2122.
Distr. (of form). Malaya, (Assam, ex *Engler*.)
Siamese name, T'Kep (ex *Kerr*).

Alismaceae.

Sagittaria sagittifolia, *Linn.*—F.B.I., vi. p. 561.
Chiengmai, in moat, 300 m., *Kerr*, 1223.
Distr. Europe, Asia, N. America.

Eriocaulaceae.

Eriocaulon luzulaefolium, *Mart.*—F.B.I., vi. p. 582; Ruhland, Engler Pflanzenr., Eriocaul., p. 88.

Chiengmai, Doi Sootep, by edge of stream and in swamp, 330–420 m., *Kerr*, 1635, 1932.

Distr. India, Burma, Khasia.

Hosseus ii. p. 372–3 also records a form of *E. truncatum* from Wang Djao and a species of *Eriocaulon* from Doi Sootep.

Cyperaceae.*

Kyllinga brevifolia, *Rottb.*—F.B.I., vi. p. 588; C. B. Clarke, Ill. Cyp., t. i.

Chiengmai, in short grass, 300 m., *Kerr*, 857; Doi Sootep, in open marsh, 660 m., *Kerr*, 2650.

Distr. Warm regions of both hemispheres, except the Mediterranean.

Kyllinga monocephala, *Rottb.*—F.B.I., vi. p. 588; C. B. Clarke, Ill. Cyp., t. ii; Hosseus, i. p. 459. *Cyperus monocephalus*, F. Muell.—Williams, Bull. Herb. Boiss., iv. (1904) p. 224.

Chiengmai, in short grass, 300 m., *Kerr*, 856.

Distr. India, China, Indo-China, Malaya, Australia, Africa.

Pycreus globosus, *Reich.* *P. capillaris*, Nees—F.B.I., vi. p. 591.

Chiengmai, Doi Sootep, in marshy ground, 340 m., *Kerr*, 1916.

Distr. Asia and Africa.

Pycreus nitens, *Nees*—F.B.I., vi. p. 591; Hosseus, i. p. 370 et ii. p. 458.

Wang Djao, 100 m., *Hosseus*, 104; Chiengmai, in pastures, 300 m., *Kerr*, 862.

Distr. Warm regions of the Old World.

Pycreus unioloides, *Makino*, Bot. Mag. Tokyo, xvii. p. 49. *Pycreus angulatus*, Nees—F.B.I., vi. p. 593; C. B. Clarke, Ill. Cyp., t. iv.

Chiengmai, Doi Sootep, in marshy ground, deciduous jungle, 400 m., *Kerr*, 1901.

Distr. Tropics.

Juncellus pygmaeus, *C. B. Clarke*, F.B.I., vi. p. 596.

Chiengmai, Doi Sootep, in marsh, 340 m., *Kerr*, 1860.

Distr. Warm regions of Asia, Africa and Australia.

Cyperus babakensis, *Steud.*—F.B.I., vi. p. 610; C. B. Clarke, Ill. Cyp., t. xv.

Chiengmai, Doi Sootep, in swamp, 340 m., *Kerr*, 1925.

Distr. India, Malaya.

Cyperus cephalotes, *Vahl*—F.B.I., vi. p. 597; C. B. Clarke, Ill. Cyp., t. vi.

Chiengmai moat, 300 m., *Kerr*, 1958.

Distr. India, China, Indo-China, Malaya, Australia.

Cyperus diffusus, *Vahl*—F.B.I., vi. p. 603; Hosseus, i. p. 458.

Chiengmai, Doi Sootep, in mixed jungle, 340 m., *Kerr*, 1903.

Distr. Warm regions of both hemispheres.

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* *Cyperaceae*, by W. B. Turrill.

Cyperus distans, *Linn.*—F.B.I., vi. p. 607.
Chiengmai, Doi Sootep, beside stream, 340 m., *Kerr*, 1937.
Distr. Warm regions of both hemispheres.

Cyperus eleusinoides, *Kunth*—F.B.I., vi. p. 608.
Chiengmai, Doi Sootep, by stream in deciduous jungle, 400 m., *Kerr*, 1180; edge of stream, 338 m., in clumps, *Kerr*, 1923; in open marshy ground, 660 m., *Kerr*, 2640.
Distr. Asia, Africa, Australia.

Cyperus Haspan, *Linn.*—F.B.I., vi. p. 600; Williams, Bull. Herb. Boiss., iv. (1904) p. 224; Hosseus, i. p. 458 et ii. p. 370.
Chiengmai, Doi Sootep, in marshy ground, eng jungle, 500 m., *Kerr*, 1895.
Distr. Warm regions of both hemispheres.

Cyperus Iria, *Linn.*—F.B.I., vi. p. 606; C. B. Clarke, Ill. Cyp., t. xiv.
Chiengmai, coming up on recently deposited silt, 300 m., *Kerr*, 892.
Distr. Old World.
Lao name, Yak dank ding (ex *Kerr*).

Cyperus leucocephalus, *Retz.*—F.B.I., vi. p. 602.
Chiengmai, Doi Sootep, deciduous jungle, 340 m., *Kerr*, 1849.
Distr. Tropics.

Cyperus pilosus, *Vahl*—F.B.I., vi. p. 609.
Chiengmai, Doi Sootep, in swamps, 340 m., *Kerr*, 1930.
Distr. Trop. Asia, Africa, Australia.

Cyperus pulcherrimus, *Willd.*—F.B.I., vi. p. 600; C. B. Clarke, Ill. Cyp., t. x.; Hosseus, i. p. 459 et ii. p. 370.
Chieng Dao, 350 m. (ex *Hosseus*).
Distr. India, Indo-China, Malaya.

Cyperus radiatus, *Vahl.*—F.B.I., vi. p. 617.
Chiengmai, in swampy ground, 310 m., *Kerr*, 1921.
Distr. Asia, Africa, America.

Cyperus rotundus, *Linn.*—F.B.I., vi. p. 614; Hosseus, i. p. 459 et ii. p. 370.
Chiengmai, in rice fields, 300 m., *Kerr*, 1540b, abundant in pastures, 300 m., *Kerr*, 2628; Wang Djao, *Hosseus*, 133a.
Distr. Warm regions of both hemispheres.
Lao name, ya m'niu mu (ex *Kerr*).

Cyperus uncinatus, *Poiret.*
Chiengmai, Doi Sootep, marshy ground, 330 m., *Kerr*, 2239a—a single small specimen mixed with *Fimbristylis schoenoides*, Vahl.
Distr. China, Malaya, Africa, Australia.

Cyperus Zollingeri, *Steud.*—F.B.I., vi. p. 613; C. B. Clarke, Ill. Cyp., t. xviii.
Chiengmai, Doi Sootep, in mixed jungle, 340 m., *Kerr*, 1900.
Distr. Trop. Asia, Africa, and Australia.

Mariscus Clarkei, *Turrill*, sp. n., affinis *M. Sieberiano*, Nees, sed foliis longis flaccidis, carinis sectione transverso rotundatis, spicis laxioribus differt.

Rhizoma breve. *Culmi* erecti, usque ad 5 dcm. alti, 1 mm. diametro, leves, basi noduloso-incrassati. *Folia* flaccida, apice acuminata, usque ad 3 dcm. longa et 2·5 mm. lata, carinis sectione transverso rotundatis, glabra. *Inflorescentia* e radiis quinque constituta, spiculis laxius dispositis; bracteae foliis similes, usque ad 2·7 dcm. longae. *Spiculae* 3 mm. longae; gluma prima (infima) longitudine praecipue variabilis, spicularum inferiorum setacea, apice acuta vel acuminata, usque ad 1 cm. longa, spicularum superiorum apice acuta, 1·5 mm. longa, 0·5 mm. lata; gluma secunda apice obtusa, 2 mm. longa, 0·75 mm. lata; gluma tertia nucigera, apice acuta, 3·5 mm. longa, 1 mm. lata, carina sectione transverso obtusa, alis haud striatis; rhachilla supra glumam nuciferam ad 3·5 mm. producta, uninervia, alis 2. *Stamina* 3, filamentis 4 mm. longis. *Stylus* (cum ramis) 5 mm. longus, ramis tribus 4 mm. longis. *Nux* 2·25 mm. longa, 0·5 mm. diametro.

INDO-CHINA. Assam: Shillong, 1500 m., *C. B. Clarke*, 43,573a. Siam: Chiengmai, Doi Sootep, in deciduous jungle, 900 m., *Kerr*, 2637.

Mariscus cyperinus, *Vahl*—F.B.I., vi. p. 621; C. B. Clarke, Ill. Cyp., t. xxii.

Chiengmai, Doi Sootep, by stream, 340 m., *Kerr*, 1928.

Distr. Trop. Asia, Polynesia.

Mariscus Dregeanus, *Kunth*—F.B.I., vi. p. 620; C. B. Clarke, Ill. Cyp., t. xxi.

Sriracha, by sea shore, *Kerr*, 2043.

Distr. India, Malaya, Africa.

Mariscus microcephalus, *Presl.*—F.B.I., vi. p. 624. *Cyperus dilutus*, Vahl—Williams, Bull. Herb. Boiss., iv. (1904) p. 224.

Chiengmai, Doi Sootep, marshy ground, 340 m., *Kerr*, 1915.

Distr. India, China, Indo-China, Malaya, Mauritius.

Mariscus paniceus, *Vahl*, var. **Roxburghiana**, *C. B. Clarke*, F.B.I., vi. p. 621.

Chiengmai, Doi Sootep, deciduous jungle, 340 m., *Kerr*, 1850.

Distr. India, Indo-China.

Eleocharis equisetina, *Presl.*—F.B.I., vi. p. 626.

Chiengmai, Doi Sootep, in marshy ground, 330 m., *Kerr*, 2621.

Distr. Ceylon, Malay Peninsula, Polynesia.

Eleocharis variegata, *Kunth*, var. **laxiflora**, *C. B. Clarke*, F.B.I., vi. p. 626.

Chiengmai, Doi Sootep, growing in swamp, 338 m., *Kerr*, 1931.

Distr. India, China, Malaya, Polynesia.

Fimbristylis aestivalis, *Vahl*—F.B.I., vi. p. 637; C. B. Clarke, Ill. Cyp., t. xli.; Hosseus, i. p. 462 et ii. p. 370.

Chieng Dao, 350 m. (ex *Hosseus*).

Distr. India, China, Indo-China, Malaya, Australia.

Fimbristylis cyperoides, *Br.*, var. **cinnamometorum**, *C. B. Clarke*, F.B.I., vi. p. 650.

Chiengmai, Doi Sootep, small tufts, deciduous jungle, 450–540 m., *Kerr*, 1270.

Distr. Ceylon, Indo-China, China.

Fimbristylis dichotoma, *Vahl*—F.B.I., vi. p. 635; Hosseus, i. p. 461 et ii. p. 370.

Chieng Dao, 350 m. (ex *Hosseus*).

Distr. Warm regions of the Old World.

Fimbristylis diphylla, *Vahl*—F.B.I., vi. p. 636; C. B. Clarke, Ill. Cyp., t. xlii.; Williams, Bull. Herb. Boiss., iv. (1904) p. 224; Hosseus, i. p. 461 et ii. p. 370.

Chiengmai, Doi Sootep, marshy ground in eng jungle, 480 m., *Kerr*, 1896; by stream in deciduous jungle, 390 m., *Kerr*, 1181; in open marsh, 660 m., *Kerr*, 2649; marshy ground, 330 m., *Kerr*, 2239b (mixed with *Fimbristylis schoenoides*, Vahl, *Kerr*, 2239).

Distr. Warm regions of both hemispheres.

The four specimens quoted above, all collected by Dr. Kerr on Doi Sootep, illustrate remarkably well the polymorphic nature of this species. No. 1181 is a tall plant growing to a height of 10 dcm., with long glaucous and slightly hairy leaves and glabrous inflorescence. No. 1896 is a medium-sized plant with shorter obtuse broad (3 mm. broad) leaves. No. 2239b is a very small and slender plant, about 12 cm. high, with very narrow leaves (0·5 mm. broad). No. 2649 is a tall plant, growing to a height of 9 dcm., with the stem and inflorescence distinctly hairy and the leaves (blades and sheaths) densely white pubescent. This last plant is evidently *Fimbristylis tomentosa*, Vahl which C. B. Clarke considered only a form of *F. diphylla*, Vahl. All the above plants have the characteristic longitudinally-ribbed nut of *F. diphylla*.

Fimbristylis Eragrostis, *Hance*, Journ. Linn. Soc., xiii. p. 132.

Chiengmai, Doi Sootep, in eng jungle, 300–600 m., *Kerr*, 825.

Distr. China, Indo-China.

Fimbristylis fuscoides, *C. B. Clarke*, Kew Bull., Add. Series, vii. p. 25.

Raheng, near Tapotsah, Wang Djao forest, *Lindhard*.

Distr. Indo-China, Borneo.

Fimbristylis globulosa, *Kunth*—F.B.I., vi. p. 644; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 140.

Chiengmai, in rice fields, 300 m., *Kerr*, 1539b.

Distr. India, Ceylon, China, Indo-China, Malaya, Polynesia.

Fimbristylis miliacea, *Vahl*—F.B.I., vi. p. 644; Williams, Bull. Herb. Boiss., iv. (1904) p. 225.

Chiengmai, in rice fields, 300 m., *Kerr*, 1538b.

Distr. All warm regions.

Fimbristylis monostachya, *Hassk.*—F.B.I., vi. p. 649; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 141.

Chiengmai, in scrub jungle, 300 m., *Kerr*, 1906.

Distr. All warm regions.

Fimbristylis nutans, *Vahl*—F.B.I., vi. p. 632.

Chiengmai, Doi Sootep, in open marshy ground, 330 m., *Kerr*, 2665.

Distr. India, China, Malaya, Australia.

Fimbristylis schoenoides, *Vahl*—F.B.I., vi. p. 634.

Chiengmai, Doi Sootep, marshy ground; 330 m., *Kerr*, 2239.

Distr. India, China, Indo-China, Malaya, N. Australia.

Kerr's specimens have all single terminal spikelets. In no case is there the slightest sign of a second spikelet, or even of a prolongation of the stem.

Fimbristylis sericea, *R. Br.*—F.B.I., vi. p. 641 ; Hosseus, i. p. 462.
Klong Prao (ex *Hosseus*).
Distr. India, China, Japan, Indo-China, Malaya, Australia.

Fimbristylis straminea, *Turrill*, Kew Bull., 1911, p. 192.
Chiengmai, Doi Sootep, in eng jungle, 550–600 m., *Kerr*, 832.

Fimbristylis tetragona, *R. Br.*—F.B.I., vi. p. 631 ; C. B. Clarke, Ill. Cyp., t. xl.
Chiengmai, rice fields, 300 m., *Kerr*, 1594 b.
Distr. India, China, Indo-China, Malaya, Australia.

Fimbristylis tortispica, *Turrill*, Kew Bull., 1911, p. 348.
Chiengmai, Doi Sootep, growing singly, deciduous jungle, 330–540 m., *Kerr*, 1271.

Fimbristylis yunnanensis, *C. B. Clarke*, Journ. Linn. Soc., xxxvi. p. 247.
Chiengmai, Doi Sootep, in deciduous jungle, 450–600 m., *Kerr*, 1193.
Distr. Yunnan, Indo-China.

Bulbostylis barbata, *Kunth*—F.B.I., vi. p. 651 ; Hosseus, i. p. 462 et ii. p. 369.
Chiengmai, Doi Sootep, 360 m., in deciduous jungle, *Kerr*, 1349 and in a clearing, 330 m., *Kerr*, 1920.
Distr. Warm regions of both hemispheres.

Scirpus grossus, *Linn. fil.*—F.B.I., vi. p. 659 ; C. B. Clarke, Ill. Cyp., t. xlix.
Chiengmai, Doi Sootep, in swamp, 330 m., *Kerr*, 1918.
Distr. India, Indo-China, Malaya.

Scirpus mucronatus, *Linn.*—F.B.I., vi. p. 657.
Chiengmai, Doi Sootep, in marshy ground, 660 m., *Kerr*, 1143.
Distr. Europe, Asia, Africa, Australia.

Scirpus squarrosus, *Linn.*—F.B.I., vi. p. 663 ; C. B. Clarke, Ill. Cyp., t. lii.
Chiengmai, Doi Sootep, eng jungle, 360 m., *Kerr*, 2244.
Distr. India, China, Trop. Africa.

Fuirena umbellata, *Rottb.*—F.B.I., vi. p. 666 ; C. B. Clarke, Ill. Cyp., t. lix.
Chiengmai, Doi Sootep, by stream in deciduous jungle, 390 m., *Kerr*, 1179 and in swamp, 330 m., *Kerr*, 1924.
Distr. Warm regions of both hemispheres.

Lipocarpha argentea, *Br.*—F.B.I., vi. p. 667 ; C. B. Clarke, Ill. Cyp., t. lx. ; Hosseus, i. p. 457 et ii. p. 370.
Chiengmai, Doi Sootep, marshy ground, 660–700 m., *Kerr*, 1178, *Hosseus*, 481.
Distr. Tropics and sub-tropics of Old World.

Ascolepis sp. n. *Scirpus squarrosus*, var. *siamensis*, C. B. Clarke apud Hosseus, i. p. 460 ; Hosseus ii. p. 371.
Chiengmai, Doi Sootep, in marshy ground by stream, 540 m., *Kerr*, 2261 ; Wang Djao, *Hosseus*, 101.

Rynchospora longisetis, *R. Br.*—F.B.I., vi. p. 669 ; C. B. Clarke, Ill. Cyp., t. lxv. ; Hosseus, i. p. 463 et ii. p. 371.

Chiengmai, rice fields, 300 m., *Kerr*, 1595b ; Wang Djao, *Hosseus*, 132 ; Raheng, *Lindhard*.

Distr. Indo-China, N. Australia.

Rynchospora Wallichiana, *Kunth*—F.B.I., vi. p. 668 ; C. B. Clarke, l. Cyp., t. lxiv.

Chiengmai, Doi Sootep, in deciduous jungle, 510 m., *Kerr*, 1219a ; open marsh, 660 m., *Kerr*, 2648.

Distr. Tropical Asia, Australia, and Africa.

A specimen from Doi Sootep, in eng jungle, 450 m., *Kerr*, 1219 is almost certainly a very young example of this species.

Scleria elata, *Thwaites*—F.B.I., vi. p. 690.

Chiengmai, Doi Sootep, in mixed and evergreen jungles, 600–900 m., *Kerr*, 1691.

Distr. India, Ceylon, China, Indo-China, Malaya.

The nuts of *Kerr*, 1691 have more prominent beaks than those of the type but otherwise the plants are similar.

A specimen collected on Doi Sootep, growing in tufts, deciduous jungle, 330–540 m., *Kerr*, 1269 is probably a young example of this species.

Scleria Kerrii, *Turrill*, Kew Bull., 1910, p. 384.

Chiengmai, Doi Sootep, in eng jungle, 300–450 m., *Kerr*, 1239.

Scleria pergracilis, *Kunth*—F.B.I., vi. p. 685 ; C. B. Clarke, Ill. Cyp., t. cxxi.

Chiengmai, Doi Sootep, eng jungle, not tufted, 360–540 m., *Kerr*, 1428 ; growing in open marsh, 660 m., *Kerr*, 2647.

Distr. India, Indo-China, Trop. Africa.

Carex baccans, *Nees*—F.B.I., vi. p. 722 ; Hosseus, i. p. 463 et ii. p. 370.

Chiengmai, Doi Sootep, 1680 m. (ex *Hosseus*).

Distr. India, China, Indo-China, Malaya.

Carex speciosa, *Kunth*—F.B.I., vi. p. 729.

Chiengmai, Doi Sootep, in open ground, 330 m., *Kerr*, 1929.

Distr. India, Indo-China, Malaya.

Carex condensata, *Nees*—F.B.I., vi. p. 716 ; Franchet, Nouv. Arch. Mus. Hist. Nat. Par., Sér. iii. vol. viii. p. 252.

Chiengmai, Doi Sootep, in open grassy jungle, 1560 m., *Kerr*, 1306 ; Doi Intanon, North Peak, 2205 m., *Garrett*, 81, rising from large matted rhizomes.

Distr. India, Indo-China.

A specimen of tufted growth, collected in a young state on Doi Sootep, 330–540 m., in deciduous jungle, *Kerr*, 1268, belongs to Clarke's section *Asiaticae* and is probably either this species or *C. cruciata*, Wahl.

Carex plebeia, *C. B. Clarke*, F.B.I., vi. p. 718.

Chiengmai, Doi Sootep, deciduous jungle, 450 m., *Kerr*, 1977.

Distr. Chota Nagpur.

Carex plesiocephala, *Turrill*, Kew Bull., 1910, p. 385.
Chiengmai, in mixed jungle at foot of Doi Sootep, 330 m, *Kerr*, 1221.
Distr. Upper Burma.

Carex sp. nov.? *C.* [*Dietrichiae*, Boeck] *juvenilis*, Hosseus, i. p. 464 et ii. p. 370 (*juvenalis*).
Nakontai, 300 m., *Hosseus*, 723.
Hosseus attributes the authorship of this species to C. B. Clarke but so far as the writer can ascertain no such species has ever been published. Nor is the writer aware of a section of the genus bearing the name *Dietrichiae*.
The mistake probably arose from a misinterpretation of C. B. Clarke's determination of the plant. Considering the immature state of the specimen of *Hosseus*, 723 in Herb. Kew the writer concludes that what C. B. Clarke in all probability meant was *Carex* sp., statu juvenili affinis *C. Dietrichiae*, Boeck.

Gramineae.*

Paspalum scrobiculatum, *Linn.*—F.B.I., vii. p. 10; Williams, Bull. Herb. Boiss., iv. (1904) p. 222.
Chiengmai, Doi Sootep, in deciduous jungle, 300–540 m., *Kerr*, 1272.
Distr. Tropics of Old World.

Eriochloa annulata, *Kunth*—Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 141. *E. polystachya*, H.B.K.—F.B.I., vii. p. 20.
Chiengmai, 300 m., by roadside, *Kerr*, 1954.
Distr. Throughout India and most hot countries.

Panicum colonum, *Linn.*—F.B.I., vii. p. 32; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 142; Williams, Bull. Herb. Boiss., iv. (1904) p. 222.
Chiengmai, banks of Meh Ping, 300 m., *Kerr*, 1887.
Distr. Throughout plains of India and most warm countries.

Panicum Crus-galli, *Linn.*—F.B.I., vii. p. 30; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 142.
Chiengmai, Doi Sootep, in swamp, 330 m., *Kerr*, 1919.
Distr. All warm countries.

Panicum distachyum, *Linn.*—F.B.I., vii. p. 37.
Chiengmai, among tall herbage, 300 m., *Kerr*, 1922.
Distr. Trop. Asia, Australia.

Panicum flavidum, *Retz.*—F.B.I., vii. p. 28; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 141.
Chiengmai, Doi Sootep, in mixed jungle, 330 m., *Kerr*, 1242.
Distr. Trop. Asia and Africa.

Panicum indicum, *Linn.*—F.B.I., vii. p. 41; Williams, Bull. Herb. Boiss., iv. (1904) p. 222.
Chiengmai, Doi Sootep, in open grassy jungle, 1500 m., *Kerr*, 1509; Raheng, Wang Djao, *Lindhard*, 20.
Distr. Trop. Asia, Australia.

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* *Gramineae*, except *Bambuseae*, by O. Stapf.

Panicum interruptum, *Willd.*—F.B.I., vii. p. 40 ; Williams, Bull. Herb. Boiss., iv. (1904) p. 222.

Chiengmai, in moat, 300 m., *Kerr*, 1960 ; Doi Sootep, on marshy ground, 330 m., *Kerr*, 2063.

Distr. India, Malaya, Africa.

Panicum Kurzii, *Hook. f.*, F.B.I., vii. p. 38.

Chiengmai, Doi Sootep, in mixed jungle, 360 m., *Kerr*, 1243.

Distr. Bengal, Behar.

Panicum myosuroides, *Br.*—F.B.I., vii. p. 42 ; Williams, Bull. Herb. Boiss., v. (1905) p. 960.

Chiengmai, 300 m., on uncultivated rice-fields, *Kerr*, 2249 ; Raheng, *Lindhard*.

Distr. India, China to Australia, Trop. Africa.

Panicum patens, *Linn.*—F.B.I., vii. p. 57. *P. radicans*, Retz.—Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 142 ; Williams, Bull. Herb. Boiss., iv. (1904) p. 222.

Chiengmai, under bamboos, 300 m., *Kerr*, 1227 ; Wang Djao, Long Ison, *Lindhard*, 35 ; Bangkok, *Schomburgk*, 179.

Distr. India, Khasia, Burma, Malay and Pacific Is.

Panicum paludosum, *Roxb.* *P. proliferum*, F.B.I., vii. p. 50.

Chiengmai, on mudbank of Meh Ping, 300 m., *Kerr*, 858.

Distr. India to South China and the Malay Archipelago.

As to *P. proliferum* of Lamarck and most American authors see Hitchcock and Chase, The North American species of Panicum (Contrib. U.S. Nat. Herb., xv. p. 50).

Panicum prostratum, *Lamk.*—F.B.I., vii. p. 33 ; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 142. *P. reptans*, L.—Hitchcock and Chase, Contrib. U.S. Nat. Herb., xv. p. 36.

Chiengmai, on waste ground, 300 m., *Kerr*, 1963.

Distr. Tropics.

Panicum repens, *Linn.*—F.B.I., vii. p. 49 ; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 141 ; Williams, Bull. Herb. Boiss., iv. (1904) p. 222.

Chiengmai, in moat, 300 m., *Kerr*, 1905 ; Bangkok, *Schomburgk*, 181.

Distr. S. Europe, Asia, Africa, America.

Digitaria fibrosa, *Stapf*, comb. nov. *Panicum fibrosum*, Hackel.

Chiengmai, Doi Sootep, in deciduous jungle, 300–600 m., *Kerr*, 1153.

Distr. Canton, Hong Kong.

Digitaria pertenuis, *Buese.*

Chiengmai, in partial shade, 300 m., *Kerr*, 847.

Distr. Malay Archipelago.

Axonopus cimicinus, *Beauv.*—F.B.I., vii. p. 64.

Chiengmai, Meh Hia, in mixed jungle by wayside, 330 m., *Kerr*, 1950.

Distr. India, Burma, China, Malaya.

Oplismenus Burmannii, *Beauv.*—F.B.I., vii. p. 68.

Chiengmai, in more or less shady situations, 300 m., *Kerr*, 846.

Distr. Tropics.

Oplismenus compositus, *Beauv.*—F.B.I., vii. p. 66; Williams, Bull. Herb. Boiss., iv. (1904) p. 222; Hosseus, ii. p. 369.

Chiengmai, Doi Sootep, in evergreen jungle, 660–1020 m., *Kerr*, 867; Doi Sootep, 800–900 m., *Hosseus*, 305.

Distr. General in the tropics.

Setaria glauca, *Beauv.*—F.B.I., vii. p. 78; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 142.

Chiengmai, in pastures, 300 m., *Kerr*, 861; Doi Sootep, in mixed and deciduous jungle, 330 m., *Kerr*, 1246.

Distr. Tropics and warm-temperate regions.

Polytoca bracteata, *Br.*—F.B.I., vii. p. 101; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 143.

Chiengmai, Doi Sootep, 540–600 m., *Kerr*, 1437, 2219, 2226.

Distr. Sikkim, Assam, Burma, Tonkin.

Polytoca Wallichiana, *Benth.*—F.B.I., vii. p. 101; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 143.

Near Kampeng Pet, edge of pampas on banks of Meh Ping, 105 m., *Kerr*, 2157.

Distr. Burma.

Oryza granulata, *Nees*—F.B.I., vii. p. 93.

Chiengmai, Doi Sootep, in mixed jungle, 330 m., *Kerr*, 1241.

Distr. India, Assam, Java.

Leersia hexandra, *Sw.*—F.B.I., vii. p. 94.

Chiengmai, Doi Sootep, in rice-fields, 330 m., *Kerr*, 1537b.

Distr. Tropics and subtropics.

Arundinella nepalensis, *Trin.* *A. brasiliensis*, Hook. f., F.B.I., vii. p. 73.

Chiengmai, Doi Sootep, in mixed jungle by stream, 540 m., *Kerr*, 2228.

Distr. India, Burma, Assam, China, Australia.

Arundinella setosa, *Trin.*—F.B.I., vii. p. 70; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 143; Williams, Bull. Herb. Boiss., v. (1905) p. 960.

Chiengmai, Doi Sootep, in eng jungle, 300–600 m., *Kerr*, 824; Raheng, *Lindhard*.

Distr. India, China, Tonkin, Philippines.

Thysanolaena Agrostis, *Nees*—F.B.I., vii. p. 61.

Chiengmai, Doi Sootep, 1650 m., *Kerr*, 1640.

Distr. India, Burma, Penang to New Guinea.

Perotis latifolia, *Ait.*—F.B.I., vii. p. 98; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 144.

Chiengmai, Doi Sootep, in deciduous jungle, 360 m., *Kerr*, 1352; Cape Liant, *Murton*, 32.

Distr. Tropics of Old World.

Imperata arundinacea, *Cyr.*—F.B.I., vii. p. 106; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 144; Kerr, Kew Bull. 1911, p. 6.

Chiengmai, Doi Sootep, on old clearings, 750 m., *Kerr*, 1097; Doi Sootep, 1670 m., *Hosseus*, 502.

Distr. Most warm countries of the Old World.

This grass is cut down yearly by the natives and used for thatching (ex *Kerr*, l.c.).

Saccharum arundinaceum, *Retz.*—F.B.I., vii. p. 119.
Raheng, 120 m., *Kerr*, 900.
Distr. India, China, Malay Peninsula.

Saccharum fuscum, *Roxb.*—F.B.I., vii. p. 120.
Near Kampeng Pet, 105 m., along with 2158 (*S. spontaneum*) *Kerr*, 2159; Raheng, 120 m., *Kerr*, 901 (growing with No. 900, *S. arundinaceum*).
Distr. India, Assam, Burma.

Saccharum spontaneum, *Linn.*—F.B.I., vii. p. 118; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 144.
Near Kampeng Pet, forming extensive growths on banks of lower Meh Ping with other grasses, 105 m., *Kerr*, 2158.
Distr. Warm regions of the old world.
Lao name, Pong (ex *Kerr*).

Pollinia articulata, *Trin.*—F.B.I., vii. p. 109.
Chiengmai, Doi Sootep, in eng jungle, 540 m., *Kerr*, 1559 b.
Distr. India, Assam, Burma, China, Malaya, Australia.

Pollinia Cumingii, *Nees*—F.B.I., vii. p. 114.
Chiengmai, Doi Sootep, in open scrub jungle, 330 m., *Kerr*, 2240.
Distr. S.E. Asia, Malaya, Australia.

Pollinia speciosa, *Hack.*—F.B.I., vii. p. 113.
Chiengmai, Doi Sootep, in open grassy jungle, 1350–1500 m., *Kerr*, 1510.
Distr. Khasia and Naga Hills, China.

Pogonatherum saccharoideum, *Beauv.*—F.B.I., vii. p. 141; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 144; Hosseus, ii. p. 369.
Chiengmai, Doi Sootep, 300–900 m., *Kerr*, 950, *Hosseus*, 291, 421.
Distr. India, Assam, Burma, China, Malaya.

Apocopis Wightii, *Nees ex Steud.*—F.B.I., vii. p. 142.
Chiengmai, Doi Sootep, in eng jungle, 540 m., *Kerr*, 2229, 823.
Distr. India to China and Tonkin.

Arthraxon microphyllus, *Hochst.*—F.B.I., vii. p. 147.
Chiengmai, Doi Sootep, on old wall, 660 m., *Kerr*, 869.
Distr. India, Tonkin, Trop. Africa.

Rottboellia compressa, *Linn. f.*—F.B.I., vii. p. 153.
Chiengmai, 300 m., *Kerr*, 2005; Doi Sootep, marshy ground by stream, 300 m., *Kerr*, 1934.
Distr. Most warm countries.

Ophiurus corymbosus, *Gaertn.*—F.B.I., vii. p. 160; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 145.
Chiengmai, Doi Sootep, in mixed jungle, 660 m., *Kerr*, 1601 b.
Distr. India, Khasia, Tonkin, Australia.

Manisuris granularis, *Linn. f.*—F.B.I., vii. p. 159; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 145.
Chiengmai, Doi Sootep, in eng jungle, 360 m., *Kerr*, 2213.
Distr. Most tropical countries.

Eremochloa leersioides, *Hack.*—F.B.I., vii. p. 140.
Chiengmai, Doi Sootep, on sandy ground in deciduous jungle, 330 m., *Kerr*, 1938.
Distr. Burma, China, Tonkin.

Ischaemum angustifolium, *Hack.*—F.B.I., vii. p. 129 ; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 145.
Chiengmai, Doi Sootep, in deciduous (eng) jungle, 300–540 m., *Kerr*, 1081.
Distr. Afghanistan, India, China, Philippines.

Ischaemum aristatum, *Linn.*—F.B.I., vii. p. 126.
Chiengmai, Doi Sootep, by streams in deciduous jungle, 450 m., *Kerr*, 1166.
Distr. India, Assam, Burma, China, Tonkin, Malaya.

Ischaemum aristatum, *Linn.*, subsp. **imberbe**, *Hack.*—Hosseus, ii. p. 369.
Chiengmai, Doi Sootep, 1050 m. (ex *Hosseus*).
Distr. India, Khasia, Philippines.

Ischaemum laxum, *R. Br.*—F.B.I., vii. p. 136 ; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 145.
Chiengmai, Doi Sootep, in eng jungle, 540 m., *Kerr*, 2255.
Distr. India to Australia in the S.E. and the Cape Verd Is. in the W.

Andropogon brevifolius, *Sw.*—F.B.I., vii. p. 165.
Chiengmai, Doi Sootep, in eng jungle, 300–450 m., *Kerr*, 896.
Distr. Tropics.

Andropogon caricosus, *Linn.*—F.B.I., vii. p. 196.
Chiengmai, in uncultivated rice fields, 300 m. *Kerr*, 2614.
Distr. India, Burma, China, Mauritius, New Caledonia.

Andropogon fastigiatus, *Sw.*—F.B.I., vii. p. 167.
Chiengmai, Doi Sootep, in eng jungle, 360 m., *Kerr*, 2243.
Distr. India, Indo-China, China, Trop. Africa and America.

Andropogon micranthus, *Kunth*, var. **spicigerus**, *Hack.*
Chiengmai, Doi Sootep, in deciduous jungle, 900 m., *Kerr*, 1982.
Distr. (of var.). China, Australia, New Caledonia.

Andropogon Pseudograya, *Steud.* *A. hirtiflorus*, Hook. f., F.B.I., vii. p. 167.
Chiengmai, Doi Sootep, in eng jungle, 540 m., *Kerr*, 2227.
Distr. S. China to Khasia Hills, Singapore, Ceylon.

Sorghum halepense, *Steud.* *Andropogon halepensis*, Brot.—F.B.I., vii. p. 182.
Meh Ping, Pak Bawng, covering low-lying areas by banks of Meh Ping, *Kerr*, 2006 ; near Kampeng Pet, 105 m., *Kerr*, 2156.
Distr. Most warm countries.
Lao name, Ya Pong (ex *Kerr*).

Chrysopogon aciculatus, *Trin.* *Andropogon aciculatus*, Retz.—F.B.I., vii. p. 188.
Chiengmai, in pastures, 300 m., *Kerr*, 842.
Distr. Trop. Asia to Australia.

Chrysopogon monticola, *Trin.* *Andropogon monticola*, Schult., var. *monticola*, proper, Hook. f., F.B.I., vii. p. 193.
Kau Phra Dang, 300 m., *Hosseus*, 160.
Distr. India, Afghanistan, S. Africa.

Vetiveria zizanioides, *Stapf*. *Andropogon squarrosus*, Linn. f.—F.B.I., vii. p. 186.

Meh Ping, Doi Noi, 300 m., *Kerr*, 2007.

Distr. Trop. Africa and Asia.

Heteropogon contortus, *Roem. et Schult*. *Andropogon contortus*, Linn.—F.B.I., vii. p. 199 ; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 146 ; Williams, Bull. Herb. Boiss., iv. (1904) p. 221.

Chiengmai, Doi Sootep, in small tufts in mixed jungle, 330 m., *Kerr*, 1267.

Distr. Tropics.

Heteropogon triticeus, *Stapf*, comb. nov. *Andropogon triticeus*, B. Br.—F.B.I., vii. p. 200.

Chiengmai, Doi Sootep, in eng jungle, 300–600 m., *Kerr*, 833.

Distr. India, Burma, Malaya, Australia.

Themeda gigantea, *Hack*., subsp. **arundinacea**, *Hack*. *Anthistiria gigantea*, Cav., subsp. *arundinacea*, Hook. f., F.B.I., vii. p. 217.

Chiengmai, *Kerr*, 1439.

Distr. Trop. Asia to Australia.

Themeda gigantea, *Hack*., subsp. **villosa**, *Hack*. *Anthistiria gigantea*, Cav., subsp. *villosa*, Hook. f., F.B.I., vii. p. 217.

Chiengmai, by stream on Doi Sootep, 540 m., *Kerr*, 2252.

Distr. Assam, Malaya.

Apluda varia, *Hack*.—F.B.I., vii. p. 150.

Near Kampeng Pet, Meh Ping banks, 105 m., *Kerr*, 2155.

Distr. Trop. Asia to Australia.

Aristida Cumingiana, *Trin. et Rupr*.—F.B.I., vii. p. 224 ; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 147 ; Hosseus, ii. p. 368.

Chiengmai, Doi Sootep, on pasture ground, 330 m., *Kerr*, 1593 b.

Distr. Trop. Africa and Asia.

Sporobolus diander, *Beauv*.—F.B.I., vii. p. 247.

Chiengmai, in pastures, 300 m., *Kerr*, 843.

Distr. Trop. Asia and Australia.

Sporobolus pulchellus, *Br*.—F.B.I., vii. p. 252.

Chiengmai, Doi Sootep, in deciduous jungle, 360 m., *Kerr*, 1351.

Distr. Behar, Chota Nagpur, Upper Burma, Australia.

Sporobolus tremulus, *Kunth*—F.B.I., vii. p. 250.

Chiengmai, on dry mud, 300 m., *Kerr*, 1695.

Distr. India, Indo-China.

Cynodon dactylon, *Pers*.—F.B.I., vii. p. 288 ; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 147.

Chiengmai, 300 m., *Kerr*, 845, 944.

Distr. Most warm countries.

Lao name, Ya pet (ex *Kerr*).

Chloris delicatula, *C. B. Clarke ex Hook. f*., F.B.I., vii. p. 290.

Chiengmai, Doi Sootep, common on stoney ground in eng jungle, 360 m., *Kerr*, 1561*b*.

Distr. Chota Nagpur, Burma.

Dactyloctenium aegyptiacum, *Willd*. *Eleusine aegyptiaca*, Desf.—F.B.I., vii. p. 295 ; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 148.

Chiengmai, 300 m., in pastures, *Kerr*, 859.

Distr. Tropics and subtropics.

Eleusine indica, *Gaertn.*—F.B.I., vii. p. 293 ; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 148 ; Williams, Bull. Herb. Boiss., iv. (1904) p. 223.

Chiengmai, 300 m., usually in partial shade, *Kerr*, 848.

Distr. Tropics of Old World.

Leptochloa chinensis, *Nees*—F.B.I., vii. p. 299.

Chiengmai, 300 m., *Kerr*, 1955—a garden weed.

Distr. Trop. Asia to Australia.

Triraphis madagascariensis, *Hook. f. Neyraudia madagascariensis*, Hook. f., F.B.I., vii. p. 305.

Chiengmai, Doi Sootep, forming thickets 3–4·5 m. high on clearings, *Kerr*, 1639.

Distr. Trop. Asia, Africa, Madagascar.

Eragrostis amabilis, *Wight et Arn. ex Nees*—F.B.I., vii. p. 317 ; Williams, Bull. Herb. Boiss., v. (1905) p. 960.

Chiengmai, in pastures, 300 m., *Kerr*, 860 ; Doi Sootep, on road, 660–1020 m., *Kerr*, 866 ; Raheng, *Lindhard.*

Distr. Trop. Asia.

Eragrostis gangetica, *Roxb.* *E. elegantula*, F.B.I., vii. p. 318.

Chiengmai, Doi Sootep, on pasture grounds and in rice fields, 330 m., *Kerr*, 1899, 2623.

Distr. Trop. Asia and Africa.

Eragrostis plumosa, *Link.*—Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 149. *E. tenella*, Roem. et Sch., var. *plumosa*, Stapf, F.B.I., vii. p. 315.

Chiengmai, in pastures, 300 m., *Kerr*, 844.

Distr. Trop. Asia and Africa.

Centotheca lappacea, *Desv.*—F.B.I., vii. p. 332 ; Williams, Bull. Herb. Boiss., iv. (1904) p. 223.

Chiengmai, Doi Sooetp, in evergreen jungle, 660–1020 m., *Kerr*, 868.

Distr. Trop. Asia and Africa, Polynesia.

Bambusa arundinacea,* *Retz.*—F.B.I., vii. p. 395 ; For. Fl. Burma, ii. p. 554 ; Gamble, Ann. Roy. Bot. Gard. Calc., vii. p. 51, t. 48.

Lakon, in scrub jungle, 300 m., *Kerr*, 1011 ; Phre, Me K'Mi, in scrub jungle, 180 m., *Kerr*, 2356 ; Chiengmai, Doi Sootep, 300 m., *Hosseus*, 444 ?

Distr. India, Assam, Burma.

Lao name, Mai Pai (ex *Kerr*).

Bambusa Tulda, *Roxb.*—F.B.I., vii. p. 387 ; For. Fl. Burma, ii. p. 558 ; Gamble, Ann. Roy. Bot. Gard. Calc., vii. p. 30, t. 29 ; Hosseus, ii. p. 368.

Muang Prow, Ban Long Kaut, by streams, 600 m., *Kerr*, 1029 ; Doi Chieng Dao, 1200–1500 m., *Hosseus*, 408.

Distr. Bengal, Assam, Burma.

Thyrsostachys siamensis, *Gamble*, Ann. Roy. Bot. Gard. Calc., vii. p. 59, t. 51 ; F.B.I., vii. p. 397.

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* For the identifications of the *Bambuseae* I am indebted to Mr. J. S. Gamble.

Near Lakon, forming the greater part of some dry jungles, 300 m., *Kerr*, 973 ; Siam, *Kurz*.

Distr. Upper Burma.

Lao name, Mai Hooak (ex *Kerr*).

Oxytenanthera albociliata, *Munro*—F.B.I., vii. p. 401 ; Gamble, Ann. Roy. Bot. Gard. Calc., vii. p. 70, t. 61. *Gigantochloa albociliata*, Kurz, For. Fl. Burma, ii. p. 555.

Between Lakon and Phre, near Pang Pooey, 420 m., *Kerr*, 984 ; Chieng Dao, in eng jungle, 390 m., *Kerr*, 1060.

Distr. Burma.

Lao name, Mai Pahng, Mai Bong Pah (ex *Kerr*).

Oxytenanthera Hosseusii, *Pilger*—Hosseus, ii. p. 369.

Nakontai (ex *Hosseus*).

Dendrocalamus Brandisii, *Kurz*—F.B.I., vii. p. 404 ; For. Fl. Burma, ii. p. 560 ; Gamble, Ann. Roy. Bot. Gard. Calc., vii. p. 81, t. 71.

Chiengmai, 300 m., cultivated, *Kerr*, 891.

Distr. Burma.

Lao name, Mai Sang Yen (ex *Kerr*).

Dendrocalamus membranaceus, *Munro*—F.B.I., vii. p. 404 ; For. Fl. Burma, ii. p. 560 ; Gamble, Ann. Roy. Bot. Gard. Calc., vii. p. 81, t. 71.

Between Lakon and Phre, near Ban Meh Tah, on sides of limestone ravines, 300 m., *Kerr*, 996.

Distr. Burma.

Lao name, Mai Sang (ex *Kerr*).

Dendrocalamus nudus, *Pilger*—Hosseus, ii. p. 369.

Chiengmai, 300 m., *Hosseus*, 290*a*.

GYMNOSPERMAE.

Cycadaceae.

Cycas immersa, *Craib*, sp. n., a *C. pectinata*, Griff., et *C. siamensi*, Miq., quibus affinis, costa foliolorum supra immersa haud prominente recedit.

Truncus erectus, ad 90 cm. altus (ex *Kerr*). *Folia* circiter 70 cm. longa, petiolo circiter 19 cm. longo superne lateraliter spinoso suffulta ; rachis subtus inferne conspicue carinata, apicem versus convexa, plus minusve glabrescens, supra plus minusve distincte carinata ; foliola utrinque numerosa, lineari-lanceolata, parum falcata, apice pungentia, ad 15 cm. longa, 7 mm. lata, rigida, supra glabra, subtus minute parce brunneo-pubescentia, costa supra immersa subtus valde prominente. *Carpophylla* ambitu obovata 6·5–10·5 cm. longa, ad 5 cm. lata, tota, ovulis exceptis, hirsuto-tomentosa, ochrascentia, parte inferiore pedicellum simulante ad fere 4 cm. longa superne constricta ibique utrinque ovulo solitario instructa, parte superiore laminam acuminatam pectinato-pinnatifidam simulante ad 6 cm. longa et 5 cm. lata. *Strobili* ♂ ambitu oblongi, ad 21 cm. longi et 8 cm. diametro, pedunculo communi ad 5 cm. longo basi nudo superne squamis obtecto suffulti ;

squamae circiter 25 mm. longae, ad 18 mm. latae, supra apice excepto glabrae, subtus furfuraceo-tomentellae; acumen rigidum, sursum directum, circiter 12 mm. longum.

Between Lakon and Phre, near Pang Pooey, in deciduous jungle, 420 m., *Kerr*, 999.

Lao name, Mă Prou Tou (ex *Kerr*).

Cycas siamensis, *Miq.*—F.B.I., v. p. 657; For. Fl. Burma, ii. p. 503; Hosseus, ii. p. 367.

Ban Meh Wang, 300 m. (ex *Hosseus*).

Distr. Burma.

Gnetaceae.

Gnetum scandens, *Roxb.*—F.B.I., v. p. 642.

Chiengmai, by a stream, foot of Doi Sootep, 300 m., *Kerr*, 602.

Distr. India, Assam, Malaya.

Coniferae.

Cephalotaxus Fortunei, *Hook.* ?—Hosseus, ii. p. 368.

Doi Intanon, 1300–1650 m. (ex *Hosseus*).

Pinus khasya, *Royle*—F.B.I., v. p. 652; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 129; Hosseus, ii. p. 368.

Chiengmai, on open ridges on Doi Sootep, 900–1600 m., *Kerr*, 962, *Hosseus*, 318.

Distr. Burma, Assam, Bengal.

Lao name, Mai Kia (ex *Kerr*).

Pinus Merkusii, *Jungh.*—F.B.I., v. p. 652; Coll. et Hemsl., Journ. Linn. Soc., xxviii. p. 129.

Near Chiengrai, Hue San, common in eng jungle, 450–480 m., *Kerr*, 2506.

Distr. Burma, Cochinchina, Sumatra, Philippines.

Lao name, Mai Kia (ex *Kerr*).

LVII.—"WHITE-HEADS" OR "TAKE-ALL" OF WHEAT AND OATS.

(*Ophiobolus graminis*, Sacc.)

G. Massee.

This serious disease presents itself under two very different aspects, depending to a very great extent on the period at which the plants are attacked, and on weather conditions favouring respectively the host plant or the fungus.

In the condition known as "White-heads," the plants usually attain their full growth and the ears are of normal size, but the grain either remains undeveloped, or is very much shrivelled and useless. The ears and straw of such diseased plants present a bleached appearance, suggesting at a distance premature ripening, but on examination the entire plant proves to be dry and dead, and two or three inches at the base of the straw presents a blackened appearance, as if it had been charred. If this blackened portion

of the straw be examined with a pocket-lens, numerous minute, black, wart-like bodies will be seen, more especially on the inner side of the sheaths encircling the base of the stem. These are the fruits of the fungus causing the disease. This phase of the disease often occurs in more or less definite patches in the field, which show conspicuously at a distance owing to their whitish or bleached appearance, while the healthy part of the crop is still green.

In the condition known as "Take-all," the plants are attacked seriously at an early stage of growth and become yellow, and often die before the stem is formed, or at all events before the ear escapes from its sheath. As in the case of "White-heads" the disease spreads from a centre, and frequently considerable extended patches of such stunted plants may be found. If carefully examined the base of the plant will be found to present a somewhat blackened appearance. The roots of diseased plants are always very woolly, owing to a dense formation of root-hairs. In many instances a second lot of roots may be formed higher up on the stem of diseased plants, but these in turn are attacked by the fungus, and the plant ultimately succumbs. "White-heads" and "Take-all" were at one time considered as two independent diseases, caused by different organisms, but MacAlpine has proved that the two are caused by a fungus called *Ophiobolus graminis*, Sacc., which is always present at the base of the stem. It is readily recognised by the dark colour of its mycelium, which forms a thin felt on the stem and leaf-sheaths. Infection experiments have proved that this fungus is the direct cause of the disease.

The disease is probably far more prevalent in this country than is generally suspected. Material sent to Kew from time to time, for examination, while highly suggestive of this disease, is invariably cut off at some distance from the ground, consequently that portion of the plant that would afford actual proof of the nature of the disease is absent, and a request for a second batch including the root, is but rarely responded to. The fungus was first observed in England by Worthington G. Smith in 1884,* and named "Straw blight." It is stated that the loss occasioned ranges from one-half to one-fiftieth of the crop. The disease is also well known in Italy, France, Germany, Belgium, Australia and the United States, and is in all probability present wherever wheat is cultivated.

The reason why uncertainty as to the cause of the disease has existed so long, is due to the fact that the fungus generally produces its fruit during the winter months on the stubble, and hence has escaped observation; for during the period of growth of the wheat the mycelium only of the fungus is present.

The spores of the fungus are liberated during the winter or early spring, and remain in the soil until the required amount of moisture and temperature induces germination. According to Mangin,† the spores on germination either directly give origin to a number of colourless, minute, sickle-shaped, secondary spores, or a slender germ-tube is first formed, which bears a cluster of the secondary spores at its tip. From these secondary spores on germination a very delicate germ-tube arises, which enters the wheat plant

* Diseases of Field and Garden Crops, p. 69.
† Compt. Rend., 127, p. 286; Bull. Soc. Myc. France, 15, p. 210.

through the root-hairs. Magnin observed that when 1 per cent. of sulphate of ammonia, or 1 per cent. of phosphate of ammonia was added to the water in which the spores were placed, germination was arrested. After the mycelium has entered the root it gradually extends for three or four inches up the stem, and also passes into the sheaths surrounding the base of the stem. In addition to permeating the tissues, the mycelium also develops on

Explanation of the figures.

Fig. 1.—The appearance of the fungus at the base of oat plants. Nat. size.
„ 2.—Fungus on a leaf-sheath. Slightly mag.
„ 3.—Perithecium, or fruit of the fungus. Mag.
„ 4.—Ascus with spores escaping. Mag.
„ 5.—Spore. Mag.

the surface of the stem, and on the inner surface of the sheaths, where it assumes a dark brown colour, and forms a somewhat thick felt that can be scraped off. The minute black fruits may be found nestling in this felt of mycelium; they also occur on the root.

According to McAlpine,* wheat is the only cereal attacked by this fungus in Australia; "the oat grows well in Take-all patches, and is not attacked by the fungus, hence it is recommended for starving it out." This statement, however, does not hold good for this country, as specimens of oat plants attacked by *Ophiobolus graminis* were sent to Kew from Corwen, N. Wales, for determination during the present season. The diseased oats showed the "White-head" phase, with silvery, empty glumes, and the base of the stem and root with a copious development of blackish, superficial mycelium. The fruit of the fungus was present, setting aside all doubt as to the identity of the parasite. The crop in this instance was seriously affected, the diseased plants occurring in scattered patches. A field of wheat near Shere, in Surrey, was also badly attacked by the "White-heads" condition of this disease.

The disease gradually spreads from a centre of infection, which may be due either to the presence of the vegetative mycelium of the fungus in the soil, or to the presence of spores. If a fragment of the dark brown mycelium is placed under favourable conditions for growth, in a hanging-drop, slender colourless threads of mycelium spring from the broken ends of the dark coloured mycelium in about 24 hours; these slender threads grow and ramify very quickly. At the end of a week several such hanging-drop cultures were transferred to a large flask, containing a suitable liquid medium, where they remained for a fortnight, during which time the mycelium continued to increase in quantity, but remained quite colourless and very slender. In the meantime, a mixture of oats and wheat had been sown in a box, divided into two equal parts by a sheet of tin. When the seedlings were about 1 inch high, the contents of the flask containing the mycelium was emptied into a hole in the soil in one of the partitions of the box. Six weeks after the application of the mycelium to the soil, most of the plants, both oats and wheat, were yellow and drooping, and an examination revealed the presence of the characteristic dark-coloured mycelium in the root and passing upwards into the stem. The plants in the uninfected half of the box remained free from disease. I was not successful in causing infection of young wheat plants from spores, but in an experiment described by Mangin, it is stated that the secondary, sickle-shaped spores were sown on wheat seedlings, and at the end of four days germ-tubes were observed piercing the cell-wall of the root-hairs, and entering into the root of the plantlet.

Land that has grown a diseased crop is certain to be infected, owing to the fact that the fungus is confined to the base of the stem, which is left on the land as stubble and ploughed in. As both the spores and the vegetative mycelium are capable of infecting cereals, prompt preventive measures should be applied without fail. From what has been stated, 1 per cent. of superphosphate of lime, 1 per cent. of sulphate of ammonia, and

* Journ. Dept. Agric., Victoria, 2, p. 424.

1 per cent. of phosphate of ammonia are respectively capable of arresting the growth of the mycelium of the fungus, hence the choice of the particular fungicide resolves itself into questions as to the relative cost of each of the three substances, and also as to which of the three would be most suitable in addition as a fertiliser for a cereal crop. Superphosphate of lime has been definitely proved at Kew to arrest the growth of the fungus and this material can therefore be recommended, the quantity required being 1½ cwt. per acre. It is important that the dressing should be applied at a time when its activity as a fungicide should be present when the crop is young, as it is during this period that it is most liable to infection. Sulphate of iron has proved effective in Australia, in checking the ravages of "Take-all," 1 cwt. per acre being applied.

The earlier varieties of wheat are said to be most susceptible to the disease, and red wheats, broadly speaking, are least so, but they are not immune.

The fungus also attacks wild grasses, Couch grass (*Agropyrum repens*, Beauv.), *Bromus sterilis*, &c., hence headlands, &c., should be kept clean.

"Blindness" or abortion of the grain in the ear, may be due to other agents than *Ophiobolus graminis*. Much shrivelling of the grain and bleaching or silvering of the inflorescence in cereals and wild grasses is due to the activity of *Thrips cerealium*, Halid. a very minute insect. *Helminthosporium gramineum*, Eriks., the cause of barley leaf-stripe, also sometimes arrests the development of the grain. In both instances, the absence of blackness at the base of the stem, will clearly indicate that *Ophiobolus* is not the cause of injury.

As no proper description of *Ophiobolus* appears in any British mycological work, the following diagnosis should enable the fungus to be recognised :—

Ophiobolus graminis, Sacc. *Perithecia* scattered, blackish, large, subglobose, with a straight or more or less curved neck, 400–500 μ in diameter. *Asci* narrowly cylindric-clavate, 8-spored, 90–125 × 12–13 μ. *Spores* rod-shaped, almost colourless, 70–100 × 3 μ, 3–5–7-septate.

LVIII.—MISCELLANEOUS NOTES.

Sir Joseph Hooker.—Since the publication in *K.B.* 1912, pp. 18–34, of the List of Works by the late Sir Joseph Hooker, the following additions have been noted :—

1849.

Letter to A. von Humboldt, July 25, 1849. (Hook. Kew Journ. Bot. 1849, vol. i. pp. 337–344.)

1853.

Note on the Fossil Plants from the Shetlands. (Journ. Geol. Soc. 1853, vol. ix. pp. 49–50.)

1858.

Robert Brown ; an obituary notice. (Gard. Chron. 1858, pp. 493–4, 701, 732–3.) [*Vide* Proc. Linn. Soc. 1887–8, p. 54, footnote.]

1862.

Acanthonema strigosum, n. gen. et sp., *Berberidopsis corallina*, n. gen. et sp., *Ritchiea polypetala*, n. sp. (Curtis's Bot. Mag. 1862, tt. 5339, 5343, 5344.)

Darwin's Fertilisation of Orchids; a review. (Gard. Chron. 1862, pp. 789–790, 863, 910.) [*Vide* Life and letters of Charles Darwin, vol. iii. p. 273.]

1863.

Corysanthes limbata, n. sp., *Cypripedium Hookerae*, n. sp., *Cinchona officinalis*, *Nephelaphyllum scapigerum*, n. sp., *Bowenia spectabilis*, n. gen. et sp. (Curtis's Bot. Mag. 1863, tt. 5357, 5362, 5364, 5390, 5398.)

1865.

Moraines of the Tees Valley. (Reader, July 15, 1865, p. 71.)

1866.

The Miscellaneous Botanical Works of Robert Brown; a review. (Gard. Chron. 1866, p. 414.)

1874.

Presidential address to the Royal Society, Nov., 1874. (Proc. Roy. Soc. 1874 [1875], vol. xxiii. pp. 50–73.)

1885.

List of the Plants collected by Mr. Thomson, F.R.G.S., on the Mountains of Eastern Equatorial Africa (by D. Oliver); with Observations on their Distribution (by J. D. H.), (Journ. Linn. Soc., Bot. 1885, vol. xxi. pp. 392–396.)

1890.

Charles James Fox Bunbury; an obituary notice. (Proc. Roy. Soc. 1889 [1890], vol. xlvi. pp. xiii.–xiv.)
Asa Gray; an obituary notice. (l.c. pp. xv.–xviii.)
John Ball; an obituary notice. (Proc. Roy. Soc. 1890, vol. xlvii. pp. v.–ix.)
Miles Joseph Berkeley; an obituary notice. (l.c. pp. ix.–xii.)

1906.

Mrs. Lyell, Life of Sir C. J. F. Bunbury. 1906. (Introductory note by J. D. H.)

1909.

Impatiens d'Indo-Chine. (Lecomte, Notulae Systematicae, vol. i. pp. 10–14.)

Botanical Magazine for December.—The plants figured are *Pinus flexilis*, James (t. 8467); *Primula Juliae*, Kusnezow (t. 8468); *Akania Hillii*, Hook. f. (t. 8469); *Lissochilus Andersoni*, Rolfe (t. 8470); and *Rosa omeiensis*, Rolfe (t. 8470).

The volume for the year, with which this number of the Botanical Magazine concludes, is dedicated to Mr. John Medley Wood, A.L.S., Director of the Botanic Gardens, Durban, Natal.

Pinus flexilis is a very rare tree in British collections. Beyond the trees at Kew, one of which furnished material for the plate, the only other good specimens are the two trees at Terling Place, Essex. The species is a native of Colorado, where it was discovered near the base of Pike's Peak in 1820. It was introduced to cultivation in 1861 by Dr. Parry. It is a five-needle pine and may be distinguished from all such in cultivation by the entire margins of the leaves, the deciduous leaf sheaths, and the glabrous young shoots. *P. albicaulis* is its nearest ally, but in this species the young shoots are reddish and pubescent.

The pretty little Transcaucasian Primula, when seen in leaf only is more like a Violet than a Primula. The flowers are borne singly as in *P. acaulis*. The plant was introduced by Prof. Kusnezow, Director of the Botanic Gardens, Dorpat, and it was from a plant sent by him to Kew that the material for the plate was obtained.

Akania Hillii is a striking plant from Australia, and is of more particular interest since it is a representive of a monotypic genus of a very isolated character. It has been referred to a Natural Order of its own in *K.B.* 1912, pp. 378–9. The plant from which the illustration was prepared was received at Kew in 1872 from Mr. Linden, at Ghent, under the name of *Lomatia Bidwillii*. During the 40 years it has been at Kew it has shown no signs of flowering, but in February last it developed its beautiful white inflorescences from the hard woody stem. It is planted out in the open border of the Mexican end of the Temperate House, where it is now a graceful tree some twenty feet high.

About one hundred species of *Lissochilus* have been described from Africa. *L. Andersoni* the subject of the plate is a native of the swamps of the Gold Coast, and has been collected at Aburi, by Mr. J. Anderson, and on the Afram plain, by Mr. W. H. Johnson. The plate was prepared from a plant received from Mr. Anderson in 1908, which flowered at Kew in April, 1911. It is most nearly allied to *L. Millsoni*, Rolfe, and to *L. purpuratus*, Lindl., figured at t. 7921 of the Magazine. The petals and sepals are pale yellowish green, and the lip is white with 5–7 pale purple warted ridges.

Rosa omeiensis from Western China may be regarded as the Eastern representative of the Himalayan *R. sericea*. It differs from that species, however, by its more numerous and relatively narrower leaflets, its usually much smaller flowers, and in the thickened yellow fruiting pedicels.

It was first found by the Rev. E. Faber on Mount Omei, Szechuan, at about 8000 feet, and later Mr. A. Henry described it as forming thickets 6–10 feet high, both on Mount Omei and on the Fang Mountains in Hupeh. For its introduction we are indebted to Messrs. J. Veitch and Sons through their collector

Mr. E. H. Wilson. The plant flowered and fruited with Messrs. Veitch in 1908, and provided the material from which the plate has been prepared.

Agriculture in St. Lucia.—The Report on the Agricultural Department, St. Lucia, for 1911–12, which has recently reached us, contains evidence of considerable agricultural activity and progress in the Island. The Botanic Station has now been in existence for twenty-five years. Efforts for the improvement of the Station are being continued, but owing to its unfavourable situation, progress is necessarily difficult and slow.

It is of interest to notice that *Fagraea zeylanica*, sent from Kew in 1905, flowered and fruited in June, 1911. It has developed into a tree of shrubby habit and is considered to be a desirable garden plant.

Sugar, Cacao, and Limes are the main cultural products, and interest in the latter appears to be steadily increasing.

The system of training for the Agricultural Pupils has been re-organised and they are now to be trained at the Botanic Station. The arrangements in St. Lucia will apparently be on lines similar to those which are being carried out with success in Dominica.

British Violets.*—Mrs. Gregory's book is the outcome of more than a quarter of a century's study of the British violets in the field, the herbarium, and under cultivation. Twelve species of true violet are recognised for Britain, as compared with eight in Babington's Manual, ed. 9, the additional ones being *Viola calcarea*, Gregory, *V. epipsila*, Ledeb., *V. lactea*, Smith and *V. montana*, Linn. The arrangement of the species follows that of Borbás in the third edition of Koch's Synopsis in its general lines. Special attention has been paid to the varieties and forms, of which no fewer than 46 are recognised, in addition to hybrids and supposed hybrids.

The value of the work would have been enhanced for those possessing only a superficial knowledge of the genus by the addition of a key to the species, but its absence is compensated for to some extent by the italicising of the more important characters in the descriptions.

The book is a noteworthy contribution to the literature of a difficult genus, and will be indispensable to those attempting to acquire a critical knowledge of the British forms.

T. A. S.

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* British Violets, a monograph, by Mrs. E. S. Gregory, with an introduction by G. Claridge Druce. Cambridge. W. Heffer & Sons, Ltd. 1912. 8vo. pp. 23 and 108, pl. 4, numerous full-page and smaller text figs. 6*s*. net.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX I.—1912.

LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a select list of seeds of Hardy Herbaceous Plants and of Hardy Trees and Shrubs which, for the most part, have ripened at Kew during the year 1911. These seeds are available only for exchange with Botanic Gardens, as well as with regular correspondents of Kew. No application, except from remote colonial possessions, can be entertained after the end of February.

HERBACEOUS PLANTS.

Acaena adscendens.
glabra.
glauca.
macrostemon.
microphylla.
Novae-Zealandiae.
sericea.

Acanthus longifolius.
Perringii.

Achillea Ageratum.
crithmifolia.
grandiflora.
macrophylla.
tomentosa.

Aconitum Kusnezoffi.
moldavicum.
orientale.

Aconitum—*cont.*
rostratum.
uncinatum.
volubile.
vulparia.

Actaea spicata.
— var. rubra.

Adenophora stylosa.

Adlumia cirrhosa.

Adonis aestivalis.
autumnalis.

Aethionema cappadocicum.
iberideum.
pulchellum.
saxatile.

(21775—6a.) Wt. 118—9. 1125. 11/11. D & S.

Agrimonia odorata.
repens.

Agropyron pungens.
villosum.

Agrostis alba.
elegans.
nebulosa.

Aira caryophyllea.

Allium azureum.
cyaneum.
Fetisowii.
karataviense.
margaritaceum.
narcissiflorum.
neapolitanum.
odorum.
Ostrowskianum.
paradoxum.
pulchellum.
roseum.
Schuberti.
Tubergeni.

Alstroemeria aurantiaca.
haemantha.

Althaea armeniaca.
cannabina.
ficifolia.
kurdica.
nudiflora.
pallida.
pontica.
rosea.

Alyssum argenteum.
incanum.
podolicum.
saxatile var. citrinum.
spinosum.

Amarantus caudatus.
Dussii.
hypochondriacus.
polygamus.
retroflexus.
speciosus.

Amellus annuus.

Amethystea caerulea.

Ammi Visnaga.

Ammobium alatum.

Amphicome arguta.

Anacyclus officinarum.
radiatus.

Anchusa Barrelieri.
capensis.
italica.

Andryala integrifolia.

Anemone alpina.
baldensis.
decapetala.
multifida.
Pulsatilla.
rivularis.
sylvestris.

Angelica dahurica.

Anthericum Liliago.

Antirrhinum Asarina.
hispanicum.
Orontium.

Apera interrupta.
Spica-Venti.

Aplopappus croceus.

Aquilegia alpina.
Bertolonii.
canadensis.
chrysantha.
Einseliana.
flabellata.
glandulosa.
— var. bicolor.
olympica.

Arabis alpina.
arenosa.
hirsuta.
rosea.

Aralia cachemirica.
racemosa.

Arctium nemorosum.

Arctotis stoechadifolia.

Arenaria aretioides.
cephalotes.
graminifolia.
grandiflora.
Ledebouriana.
pinifolia.
sojanensis.

Argemone grandiflora.
hispida.

Armeria chilensis.
majellensis.
plantaginea.

Arnica amplexicaulis.
Chamissonis.
foliosa.
longifolia.
montana.
sachalinensis.

Artemisia coerulescens.
paniculata.
parviflora.
scoparia.

Asperula azurea.
ciliata.
galioides.

Asphodeline lutea.

Asphodelus albus.

Aster alpinus.
baldensis.
diplostephioides.
foliaceus.
Herveyi.
macrophyllus.
radula.
subcaeruleus.
Thomsoni.

Astilbe chinensis.
Davidii.
grandis.
rivularis.
simplicifolia.
Thunbergii.

Astragalus alopecuroides.
alpinus.
boeticus.
chinensis.
chlorostachys.
danicus.
Echinus.
frigidus.
Glyciphyllos.
pentaglottis.
xiphocarpus.

Astrantia Biebersteinii.
helleborifolia.

Astrocarpus Clusii.

Athamanta Matthioli.

Atriplex littoralis.
rosea.
sibirica.

Atropa Belladonna.
lutescens.

Aubrietia Pinardi.
tauricola var. alba.

Baeria coronaria.

Baptisia australis.
leucantha.

Barbarea arcuata.
intermedia.
praecox.
stricta.

Basella rubra.

Beckmannia erucaeformis.

Bellium bellidioides.

Berkheya Adlami.

Beta Bourgaei.
trigyna.

Bidens leucantha.

Biscutella auriculata.
ciliata.
laevigata.

Blumenbachia insignis.
muralis.

Bocconia cordata.
microcarpa.

Bongardia Rauwolfii.

Brachycome iberidifolia.
— var. alba.

Brachypodium caespitosum.
japonicum.
pinnatum.
sylvaticum.

Brassica alba.
campestris.
Cheiranthos.
Erucastrum.

Brassica—*cont.*
juncea.
rugosa.
Tourneforti.

Brevoortia Ida-Maia.

Briza geniculata.
gracilis.
maxima.
minor.

Brodiaea congesta.
grandiflora.
lactea.
laxa.
peduncularis.
Purdyi.

Bromus adoënsis.
breviaristatus.
carinatus.
ciliatus.
commutatus.
japonicus.
Kalmii.
macrostachys.
madritensis.
marginatus.
maximus.
Porteri.
Richardsoni.
rubens.
secalinus.
squarrosus.
Tacna.
Trinii.
unioloides.

Bulbine annua.

Bulbinella Hookeri.

Bunias orientalis.

Buphthalmum salicifolium.

Bupleurum longifolium.
stellatum.

Calamagrostis confinis.

Calandrinia pilosiuscula.
speciosa.
umbellata.

Calceolaria hyssopifolia.
mexicana.
polyrrhiza.

Callirhoë pedata.

Callistephus hortensis.

Calochortus albus.
pulchellus.

Caltha elata.

Calystegia sepium var. dahurica.

Camassia Cusickii.
esculenta.
Fraseri.
Leichtlinii.
montana.

Camelina sativa.

Campanula alliariaefolia.
Allionii.
barbata.
Beauverdiana.
bononiensis.
lactiflora.
lanata.
latifolia.
latiloba.
longistyla.
macrostyla.
michauxioides.
phyctidocalyx.
primulaefolia.
punctata.
Scheuchzeri.
speciosa.
spicata.
thyrsoides.
velutina.
Waldsteiniana.

Capsella grandiflora.
Heegeri.

Carbenia benedicta.

Carduus cernuus.
Kerneri.
niveus.
tenuiflorus.

Carex arctata.
pendula.
tomentosa.

Carthamus flavescens
lanatus.
leucocaulos.
tinctorius.

Carum copticum.

Catananche coerulea.

Cedronella triphylla.

Celmisia holosericea.
petiolata.

Celsia orientalis.

Cenia turbinata.

Centaurea amara.
babylonica.
montana.
phrygia.
pulchra.
rupestris.
ruthenica.
spicata.

Centranthus macrosiphon.
Sibthorpii.

Cephalaria alpina.
tatarica.

Cerastium Biebersteinii.
Boissieri.
perfoliatum.
tomentosum.

Chaerophyllum aromaticum.
nodosum.

Charieis heterophylla.

Chelone Lyoni.
obliqua.

Chenopodium Bonus-Henricus.
foetidum.
urbicum.
virgatum.

Chloris barbata.
elegans.

Chlorogalum pomeridianum.

Chorispora tenella.

Chrysanthemum carinatum.
cinerariaefolium.
coronarium.
corymbosum.
Myconis.
multicaule.
prealtum.
viscosum.

Chrysopogon Gryllus.
nutans.

Cicer arietinum.

Cimicifuga americana.
cordifolia.
foetida.
racemosa.
simplex.

Cladanthus proliferus.

Cladium Mariscus.

Clarkia elegans.
pulchella.
virgata.

Clematis Douglasii.

Clypeola Jouthlaspi.

Cnicus arachnoideus.
syriacus.

Cochlearia danica.
glastifolia.
officinalis.
saxatilis.

Codonopsis lanceolata.
ovata.

Coix Lachryma-Jobi.

Collinsia bartsiaefolia.
bicolor.
verna.

Collomia coccinea.
gilioides.
grandiflora.

Conringia orientalis.

Convolvulus farinosus.
libanoticus.
tricolor.
undulatus.

Coreopsis auriculata.
Drummondi.
tinctoria.

Coriandrum sativum.

Corispermum nitidum.

Coronilla cappadocica.
elegans.
scorpioides.

Corydalis capnoides.
cheilanthifolia.
thalictrifolia.

Crambe orientalis.

Crepis blattarioides.
grandiflora.
rubra.
sibirica.

Crithmum maritimum.

Crocus alatavicus.
asturicus.
aureus.
chrysanthus.
etruscus.
hadriaticus.
Imperati.
medius.
nudiflorus.
Olivieri.
pulchellus.
reticulatus.
Sieberi.

Crucianella aegyptiaca.

Cynodon Dactylon.

Cynoglossum cheirifolium.
montanum.
Wallichii.

Cynosurus echinatus.

Dactylis altaica.
Aschersoniana.

Dahlia coronata.
gracilis.
Merckii.
variabilis.

Datura inermis.
Tatula.

Delphinium Brunonianum.
cardinale.
cashmirianum.
caucasicum.
decorum.
dyctiocarpum.
elatum.
formosum.
Geyeri.
grandiflorum.
hybridum.
Maackianum.

Delphinium—*cont.*
occidentale.
Pylzowi.
speciosum.
— var. glabratum.
sulphureum.
trolliifolium.

Demazeria loliacea.

Deschampsia caespitosa.

Desmodium canadense.
canescens.

Deyeuxia Langsdorfii.

Dianthus arboreus.
arenarius.
caesius.
capitatus.
carthusianorum.
Caryophyllus.
deltoides.
fragrans.
giganteus.
hirtus.
leptopetalus.
neglectus.
petraeus.
pinifolius.
pungens.
Requienii.
Seguieri.
squarrosus.
superbus.
sylvestris.
tener.
Waldsteinii.

Dictamnus albus.

Digitalis ambigua.

Dimorphotheca aurantiaca.
hybrida.
pluvialis.

Dipcadi serotinum.

Diplachne fusca.

Dipsacus asper.
atratus.
Fullonum.
pilosus.
plumosus.

Disporum lanuginosum.

Dodecatheon Meadia.

Dorycnium herbaceum.
rectum.

Downingia elegans.

Draba alpina.
altaica.
Athoa.
aurea.
cuspidata.
fladnizensis.
grandiflora.
incana.
Mawii.
nivalis.
rigida.

Dracocephalum austriacum.
heterophyllum.
Moldavicum.
peltatum.
Ruyschiana.
speciosa.

Dulichium spathaceum.

Ecballium Elaterium.

Eccremocarpus scaber.

Echinacea purpurea.

Echinaria capitata.

Echinocystis lobata.

Echinodorus ranunculoides.

Echinops Ritro.

Echium plantagineum.

Eleusine indica.

Elsholtzia cristata.

Elymus virginicus.

Emilia flammea.

Encelia calva.

Epilobium Dodonaei.
latifolium.

Epipactis palustris.

Eragrostis abyssinica.

Erigeron alpinus.
Coulteri.
Ellisii.
flagellaris.
glabellus.
grandiflorus.
leiomerus.
macranthus.
neo-mexicanus.
philadelphicus.

Erinus alpinus.

Erodium amanum.
cheilanthifolium.
daucoides.
macradenum.
Manescavii.
moschatum.

Eruca sativa.

Eryngium agavefolium.
alpinum.
Bourgati.
planum.
vesiculosum.
Zabelii.

Erysimum Perofskianum.
rupestre.

Erythraea ramosissima.

Erythronium revolutum.

Eschscholzia caespitosa.
californica.
Douglasii.

Eucharidium concinnum.

Eupatorium ageratoides.
purpureum.

Euphorbia Characias.
Heldreichii.
heterophylla.
portlandica.

Fedia Cornucopiae.

Felicia tenella.

Ferula syriaca.
tingitana.

Festuca gigantea.
Myuros.
Poa.
rigida.
uniglumis.
vaginata.

Fragaria Daltoniana.
indica.

Francoa appendiculata.

Frasera speciosa.

Galactites tomentosa.

Galega orientalis.
patula.

Galeopsis Ladanum.
Tetrahit.

Galium thymifolium.

Gastridium australe.

Gazania pygmaea.

Gentiana asclepiadea.
— var. alba.
Cruciata.
decumbens.
Freyniana.
phlogifolia.
Przewalskii.
robustus.
septemfida.
tibetica.
Walujewi.

Geranium albiflorum.
Endressi.
eriostemon.
Fremontii.
ibericum.
incisum.
maculatum.
rivulare.
sessiliflorum.

Gerbera Anandria.
nivea.

Geum album.
elatum.
Heldreichii.
montanum.
pyrenaicum x rivale.

Gilia achilleaefolia.
androsacea.
— var. alba.
capitata.
densiflora.
liniflora.
micrantha.
multicaulis.
squarrosa.
tricolor.

Gillenia stipulacea.

Glaucium corniculatum.
flavum.
— var. fulvum.
— var. tricolor.
leiocarpum.

Globularia vulgaris.

Glyceria distans.

Grammanthes gentianoides.

Gratiola officinalis.

Grindelia integrifolia.

Gypsophila acutifolia.
elegans.
fastigiata.
muralis.
paniculata.
prostrata.
viscosa.

Hastingsia alba.

Hebenstretia tenuifolia.

Hedysarum altaicum.
esculentum.
flavescens.
Semenovii.

Helenium Bigelovii.
Bolanderi.

Helianthemum salicifolium.
Tuberaria.

Helianthus cucumerifolius.

Helichrysum bracteatum.

Helipterum corymbosum.

Hemizonia pungens.

Heracleum gummiferum.
Lehmannianum.
Mantegazzianum.
pyrenaicum.
Wallichii.

Hesperis matronalis.

Heuchera Drummondi.
foliosa.
Wheeleri.

Hibiscus Trionum.

Hieracium alpinum.
amplexicaule.
Bornmülleri.
pannosum.
villosum.

Hilaria rigida.

Hordeum bulbosum.
jubatum.
maritimum.

Horminum pyrenaicum.

Hunnemannia fumariaefolia.

Hymenophysa pubescens.

Hyoscyamus albus.

Hyoseris niger.
scabra.

Hypecoum procumbens.

Hypericum Ascyrum.
chinense.
Coris.
crenulatum.
fragile.
hirsutum.
olympicum.

Hypochaeris glabra.
maculata.

Iberis Amara.
Lagascana.
Tenoreana.
umbellata.

Impatiens Noli-tangerre.

Incarvillea Delavayi.
grandiflora.
— var. brevipes.

Inula barbata.
ensifolia.
macrocephala.
orientalis.
racemosa.
squarrosa.

Iris filifolia.
juncea.
Hookeri.
tectorum.
tingitana.

Isatis Boissierina.
glauca.

Jasione humilis.
perenne.

Juncus alpinus.
Chamissonis.
squarrosus.

Jurinea ambigua.

Kitaibelia vitifolia.

Kochia scoparia.

Koeleria albescens.
alpicola.
phleoides.
splendens.

Lactuca Bourgaei.
hastata.

Lagascea mollis.

Lagurus ovatus.

Lallemantia canescens.
iberica.
Royleana.

Lamarckia aurea.

Laserpitium Siler.

Lathyrus angulatus.
Aphaca.
articulatus.
Cicera.
cirrhosus.
Clymenum.
filiformis.
luteus.
maritimus.

Lathyrus—*cont.*
montanus.
Ochrus.
rotundifolius.
setifolius.
tingitanus.
tuberosus.
undulatus.
variegatus.
venosus.

Lavatera cachemiriana.
trimestris.
— var. alba.

Layia elegans.
glandulosa.

Leonurus Cardiaca.
sibiricus.
tataricus.

Lepidium Smithii.

Leptosyne Douglasii.
maritima.

Leuzea conifera.

Ligusticum alatum.
discolor.
scoticum.

Lilium Bloomerianum.
columbianum.
Parryi.
parvum.
pyrenaicum.
sutchuenense.

Limnanthes alba.
Douglasii.

Linaria anticaria.
aparinoides.
bipartita.
maroccana.
multipunctata.
origanifolia.
reticulata.
saxatilis.
triphylla.
tristis.
viscida.

Linum angustifolium.
nervosum.
usitatissimum.

Lippia nodiflora.

Lobelia sessilifolia.
syphilitica.

Lonas inodora.

Lotus ornithopodioides.
Requienii.
Tetragonolobus.

Lunaria biennis.
rediviva.

Lupinus arboreus.
Barkeri.
concinnus.
Douglasii.
elegans.
guatemalensis.
Hartwegii.
micranthus.
nanus.
pilosus.
pubescens.

Luzula albida.
multiflorus.
nivea.

Lychnis alpina.
chalcedonica.
coronaria.
fulgens.
Haageana.
Lagascae.
Preslii.

Lycurus phleoides.

Lysimachia barystachya.
clethroides.
decurrens.
dubia.
punctata.

Madia dissitiflora.
elegans.
sativa.

Malcolmia africana.
bicolor.
chia.
flexuosa.

Malope trifida.

Malva Duriaei.
'oxyloba.
parviflora.

Malvastrum limense.

Matthiola sinuata var. glabra albiflora.

Meconopsis aculeata.
cambrica.
heterophylla.
racemosa.

Medicago Echinus
Helix.
hispida.
littoralis.
Murex.
orbicularis.
scutellata.
turbinata.

Melanthium virginicum.

Melica altissima.
ciliata.

Mimulus cardinalis.
Lewisii.

Mirabilis divaricata.
Jalapa.
Wrightiana.

Molinia coerulea.

Moloposperma cicutarium.

Monarda didyma.
fistulosa.

Monolepis trifida.

Moscharia pinnatifida.

Muhlenbergia mexicana.

Muscari armeniacum.
atlanticum.
compactum.
paradoxum.
parviflorum.

Myagrum perfoliatum.

Myosurus minimus.

Myriactis Gmelini.

Nardus stricta.

Nemesia strumosa.
versicolor.

Nepeta caesarea.
coerulescens.
discolor.
macrantha.
nuda.
Sibthorpii.

Nicandra physaloides.

Nicotiana affinis.
Langsdorffii.
paniculata.
rustica.
Sanderae.
sylvestris.
Tabacum.

Nigella corniculata.
damascena.
hispanica.

Ochthodium aegyptiacum.

Oenanthe silaifolia.

Oenothera mexicana.
pumila.
Romanzowi.
tenella.
tenuifolia.
triloba.

Omphalodes linifolia.

Ononis alopecuroides.
hircina.

Onopordon Acanthium.
bracteatum.

Ornithogalum arcuatum.
narbonense.

Oryzopsis miliacea.

Ourisia macrophylla.

Oxyria digyna.

Oxytropis lapponica.
ochroleuca.
sulphurea.

Paeonia Bakeri.
decora var. alba
— var. Pallasii.
microcarpa.
paradoxa.
tenuifolia.
triternata.
Veitchii.
Wittmaniana.

Palaua dissecta.

Panicum capillare.
proliferum.

Papaver alpinum.
Argemone.
commutatum.
glaucum.
laevigatum.
nudicaule.
orientale.
pavoninum.
rupifragum.
somniferum.

Parnassia asarifolia.
palustris.

Parrya Menziesii.

Paspalum elegans.

Peltaria alliacea.

Pennisetum macrourum.
Ruppelii.

Pentstemon barbatus.
campanulatus.
confertus.
diffusus.
gentianoides.
glaber.
gracilis.
heterophyllus.
laevigatus.
pubescens.
secundiflorus.
triflorus.
virgatus.

Phacelia congesta.
malvaefolia.
Parryi.
tanacetifolia.
viscida.

Phalaris brachystachys.
bulbosa.
minor.
paradoxa.

Phleum arenarium.
asperum.
Boehmeri.

Phlomis cashmiriana.
tuberosa.
umbrosa.
viscosa.

Phlox glaberrima.

Phuopsis stylosa.

Physalis Alkekengi.
Bunyardi.
Francheti.
ixiocarpa.

Physochlaina orientalis.

Physostegia virginiana.

Phyteuma canescens.
Michelii.
nigrum.
orbiculare.
Scheuchzeri.
serratum.
spicatum.

Phytolacca acinosa.
bogotensis.
icosandra.

Picradenia Earlei.

Plagius Allionii.

Plantago Candollei.
Coronopus.
Lagopus.
maritima.
maxima.
ovata.
Psyllium.
tibetica.

Platycodon glaucum.
grandiflorum.
— var. Mariesii.

Plectranthus glaucocalyx.

Plumbago micrantha.

Poa abyssinica.
violacea.

Podolepis gracilis.

Podophyllum Emodi.
peltatum.

Polemonium flavum.
mexicanum.
pauciflorum.

Polycalymna Stuartii.

Polycarpon tetraphyllum.

Polygonum affine.
alpinum.
rude.
viviparum.
Weyrichii.

Polypogon littoralis.

Portulaca grandiflora.

Potentilla arguta.
argyrophylla.
aurea.
crinita.
Detommasii.
Fenzlii.
fulgens.
gelida.
glandulosa.
gracilis.
Herbichii.
Hippiana.
mollis.
montenegrina.
Mooniana.
nepalensis.
norvegica.
pennsylvanica.
recta.
rivale.
rupestris.
semilaciniata.
sericea.
tanacetifolia.
Thurberi.
tridentata.

Pratia angulata.
begonifolia.

Prenanthes purpurea.

Preslia cervina.

Primula capitata.
denticulata.
— var. alba.
Forrestii.
japonica.
mollis.
pulverulenta.
rosea.
verticillata.

Psoralea acaulis.
macrostachya.
physodes.

Ramondia pyrenaica.
— var. alba.

Ranunculus aconitifolius.
Chius.
lanuginosus.
Thora.

Reseda virgata.

Rhagadiolus edulis.

Rheum acuminatum.
Collinianum.
inopinatum.
Webbianum.

Rodgersia aesculifolia.
pinnata.
podophylla.

Roemeria hybrida.

Romulea speciosa.

Rudbeckia amplexicaulis.
californica.
speciosus.
subtomentosa.

Rumex maximus.
orientalis.
salicifolius.
sanguineus.
vesicarius.

Salvia Aethiopis.
argentea.
carduacea.
coccinea.

Salvia—*cont.*
Columbariae.
cyanescens.
Horminum.
japonica.
nutans.
patens.
Schiedeana.
Sclarea.
Souliei.
tiliaefolia.
verticillata.
virgata.
viridis.

Sambucus Ebulus.
— var. latifolius.

Saponaria Vaccaria.

Saussurea albescens.
discolor.
hypoleuca.
salicifolia.

Saxifraga ambigua.
cartilaginea.
cochlearis.
— var. minor.
Cotyledon.
crustata.
Fortunei.
Hostii.
lingulata.
— var. lantoscana.
luteo-viridis.
Macnabiana.
madida.
media.
mutata.
peltata.
rocheliana.
rotundifolia.
Sibthorpii.
sponhemica.
tellimoides.
tenella.

Scabiosa australis.
caucasica.
dalmatica.
graminifolia.
isetensis.
Kitaibelii.
leucophylla.
longifolia.

Scabiosa—*cont*
songarica.
vestina.

Schizanthus Grahami.
pinnatus.

Scilla autumnalis.
cilicica.
hispanica.
patula.
verna.

Scolymus hispanicus.
maculatus.

Scopolia lurida.
sinensis.

Scorpiurus vermiculata.

Scrophularia alata.
Scorodonia.

Scutellaria alpina.
altissima.
indica var. japonica.
lateriflora.
orientalis.
Tourneforti.

Secale cereale.

Securigera Coronilla.

Sedum alsinoides.
altissimum.
Anacampseros.
Ewersii.
maximum.
oppositifolium.
roseum.

Selinum serbicum.
tenuifolium.
vaginatum.

Senecio abrotanifolium.
adonidifolium.
alpinum.
campestris.
Clivorum.
Doria.
Doronicum.
elegans.
Eubaeus.
Ledebouri.
Ligularia.

Senecio—*cont.*
nemorensis.
stenocephalus.
turkestanicus.
Veitchii.
Wilsoniana.

Serratula Gmelinii.
tinctoria.

Seseli osseum.

Sesleria argentea.

Setaria glauca.
italica.
vulpiseta.

Sidalcea candida.
malvaeflora.
neo-mexicana.

Siderites scordioides.

Siegesbeckia orientalis.

Silene alpestris.
Armeria.
asterias.
chloraefolia.
ciliata.
colorata.
conoidea.
cretica.
echinata.
elegans.
fruticulosa.
gigantea.
glauca.
laeta.
linicola.
longicilia.
melandrioides.
Muscipula.
nemoralis.
noctiflora.
nocturna.
Otites.
paradoxa.
pendula.
quadrifida.
Saxifraga.
sedoides.
Sendtneri.
squamigera.
tatarica.

Silene—*cont.*
tenuis.
verecunda.
wolgensis.
Zawadskii.

Silphium Asteriscus.
integrifolium.
scaberrimum.
trifoliatum.

Silybum Marianum.

Sisymbrium polyceratum.
strictissimum.
Sophia.

Sisyrinchium angustifolium.
californicum.
chilense.
iridifolium.
pedunculatum.
striatum.

Sorghum saccharatum.

Specularia falcata.
hybrida.
pentagonia.
perfoliata.
Speculum.

Sporobolus cryptandrus.
Wrightii.

Stachys Alopecuros.
annua.
citrina.
graeca.
grandiflora.
longifolia.

Statice bellidifolia.
Gmelinii.
speciosa.
Suwarowii.

Steironema ciliatum.

Stipa Calamagrostis.
Lessingiana.
papposa.
spartea.
splendens.

Swertia longifolia.
perennis.

Symphyandra Hofmanni.
Wanneri.

Symphytum asperrimum.

Synthyris reniformis.

Tellima grandiflora.

Tetragonia crystallina.
expansa.

Teucrium Arduini.
canadense.
hyrcanicum.
Scorodonia.

Thalictrum angustifolium.
aquilegifolium.
calabricum.
dioicum.
Fendleri.
maximum.
odoratum.
orientale.

Thapsia garganica.

Thermopsis fabacea.
rhombifolia.

Thlaspi perfoliatum.

Thymus odoratissimus.

Tofieldia calyculata.

Tolmiea Menziesii.

Tolpis coronopifolia.

Tragopogon major.
orientalis.

Tragus racemosus.

Trautvetteria palmata.

Tricholepis macropoda.

Tricyrtis latifolia.

Trifolium alpestre.
elegans.
incarnatum.
Johnstoni.

Trifolium—*cont.*
physodes.
pratense.
rubens.
scabrum.
stellatum.
striatum.

Trigonella caerulea.
corniculata.
cretica.
Foenum-graecum.
ovalis.
polycerata.
radiata.

Trillium grandiflorum.

Triticum amyleum.

Trollius asiaticus.
pumila.
sinensis.

Troximon grandiflorum

Tulipa Batalini.
dasystemon.
linifolia.
Sprengeri.

Tunica Saxifraga.

Urcspermum Dalechampii.

Ursinia pulchra.

Urtica pilulifera.
— var. balearica.

Valerianella Auricula.
coronata.
dentata.
Dioscoridis.
echinata.
eriocarpa.
vesicaria.

Veratrum nigrum.

Verbascum Chaixii.
leiocarpum.
longifolium.
olympicum.
rubiginosum.

Verbena bonariensis.
erinoides.
urticaefolia.
venosa.

Verbesina encelioides.
helianthoides.

Veronica austriaca.
crassifolia.
gentianoides.
glauca.
grandis.
incana.
longifolia.
monticola.
orchidea.
saxatilis.
spicata.
— var. hybrida.
virginica.

Vesicaria reticulata.
utriculata.

Vicia angustifolia.
atropurpurea.
bithynica.
calcarata.
canescens.
lutea.
narbonensis.
Orobus.
pisiformis.
pyrenaica.
sylvatica.
unijuga.

Vincetoxicum fuscatum.
nigrum.

Viola cornuta.
lutea.
Munbyana.
pinnata.

Zygadenus elegans.

TREES AND SHRUBS.

Those marked with an asterisk were not grown at Kew.

Acanthopanax divaricatum.
*ricinifolium.
sessiliflorum.

Acer circinatum.
nikoense.

Ailanthus glandulosa.

Alnus barbata.
cordifolia.
elliptica.
incana.
japonica.
nitida.
orientalis.
Spaethii.
sitchensis.
tenuifolia.
viridis.

Aralia chinensis.

*Arbutus Unedo.

Berberis acuminata.
angulosa.
aristata.
concinna.
dictyophylla.
Hookeri.
orthobotrys.
parvifolia.
Thunbergii.
umbellata.
Vilmoriniana.
yunnanense.

Betula Ermani.
fontinalis.
fruticosa.
glandulosa.
humilis.
lutea.
papyrifera.
populifolia.

Buddleia albiflora.
globosa.
variabilis.
— var. Veitchianus.

Caragana arborescens.
— var. Redowskii.
aurantiaca.

Carmichaelia australis.

Carya porcina.

Ceanothus integerrimus.
thyrsiflorus.
velutinus.

Celastrus articulatus.
flagellaris.
scandens.

Celtis occidentalis.

Cephalotaxus drupacea.

Cercis Siliquastrum.

Cercocarpus parvifolius.

Cistus hirsutus.
laurifolius.
monspeliensis.

Cladrastis amurensis.

Clematis aethusifolia.
coccinea.
Flammula.
fusca.
globosa.
heraclaefolia.
intermedia.
montana.
— var. rubens.
songarica.
vernalis.
Viticella.

Clerodendron trichotomum.

Colutea arborescens.
bullata.
istria.
media.

Cornus macrophylla.

Cotoneaster affinis.
applanata.
bacillaris.
bullata.
buxifolia.
frigida.
Franchetii.
horizontalis.
integerrima.
Lindleyi.
microphylla, var. glacialis.
Nummularia.
pannosa.
rotundifolia.
Simonsii.
*sp. China. 5545, Forrest.
thymifolia.

*Crataegus Arnoldiana.
atrorubens.
Carrierei.
coccinea.
cordata.
Crus-Galli.
Dippeliana.
durobrivensis.
flava.
mexicana.
mollis.
tanacetifolia.
tomentosa.

*Cryptomeria japonica.

Cupressus obtusa.
*thurifera.
thyoides.

Cydonia Maulei.

Cytisus albus.
— var. incarnatus.
biflorus.
capitatus.
nigricans.

Cytisus—*cont.*
purgans.
scoparius var. Andreanus.
sessilifolius.

Daboëcia polifolia.

Daphne Mezereum.

Deutzia crenata.
scabra.
Sieboldiana.

Elaeagnus multiflora.
umbellata.

Eleutherococcus Henryi.
Simonii.

Enkianthus campanulatus.

Erica stricta.

Escallonia pterocladon.

Euonymus latifolius.
oxyphyllus.
planipes.

Exochorda Alberti.

Garrya elliptica.

Gaultheria Shallon.

Genista aethnensis.
germanica.
pilosa.
radiata.
tinctoria.
virgata.

Halesia hispida.
tetraptera.

Helianthemum halimifolium.
polifolium.

Hippophaë rhamnoides.

Hydrangea aspera.
petiolaris.
vestita.

Hypericum Androsaemum.
aureum.
Buckleii.

Hypericum—*cont.*
densiflorum.
elatum.
hircinum.
Hookerianum.
patulum.
— var. Henryi.

Ilex Sieboldii.
verticillata.

Indigofera Gerardiana.

Jasminum fruticosa.
humile.

Juglans nigra.

Kalmia cuneata.

Kolreuteria paniculata.

Leycesteria formosa.

*Ligustrum sp. China. 5984, Forrest.

Lonicera alpigena.
belgica.
coerulescens.
dioica.
Henryi.
iberica.
Maackii.
segreziensis.
translucens.
Xylosteum.

Lupinus arboreus.

Lycium Grevilleanum.
pallidum.

Lyonia ligustrina.

*Maclura aurantiaca.

Menziesia globularis.

Myricaria germanica.

Neillia amurensis.
capitata.
opulifolia.

Nesaea salicifolia.

Olearia Haastii.

Ononis fruticosa.

Palinrus australis.

Pernettya mucronata.

Petteria ramentacea.

Phellodendron japonicum.

Philadelphus californicus.
insignis.
Lewisii.
tomentosa.

Picea Engelmannii.

Pieris formosa.

*Pinus contorta.
monticola.
Peuke.
*ponderosa.
*Strobus.

Platanus orientalis.

Potentilla fruticosa.

Prunus acida var. semperflorens.
Cuthbertii.
*Sargentii.

Ptelea Baldwinii.
trifoliata.

Pyrus americana.
crataegifolia.
Hostii.
ioensis.
Niedzwetzkyana.
prunifolia.
Ringo.
rotundifolia.
sambucifolia.
Schiedeckeri.
sikkimensis.

Rhamnus cathartica.
divaricatum.
Erythroxylon.
Frangula.

Rhododendron caucasicum.
ferrugineum.

Rhodotypus kerrioides.

Ribes cruentum.
divaricatum.
pallidum.
pubescens.
robustum.
rotundifolium.
Warscewiczii.

Robinia Kelseyi.

*Rosa laxa.
rubrifolia.
sericea.

Rubus diversifolius.
Drejeri.
lasiostylus.
nigro-baccus.
parvifolius.
pubescens.
pulcherrimus.
thyrsiger.
xanthocarpus.

Ruta graveolens.

Sambucus glauca.
racemosa.

Securinega fluggeoides.

Skimmia japonica.

Sophora viciifolia.

Spartium junceum.

Spiraea Aitchisoni.
arcuata.
bracteata.

Spiraea—*cont.*
canescens.
discolor.
stellipila.

Staphylea colchica.
Coulombieri.
pinnata.

Stephanandra Tanakae.

Styrax japonicum.

Symphoricarpus mollis.
racemosus.

Syringa Emodi.

Taxus cuspidata.

Thuya orientalis.

Vaccinium candicans.
hirsutum.
padifolium.
simulatum.

Viburnum cotinifolium.
dentatum.
Lentago.
Opulus.
phlebotrichum.
pubescens.
rhytidophyllum.
Sargentii.
Wrightii.

Vitis amurensis.
orientalis.
serianaefolia.

Zanthoxylum Bungei.

Zenobia speciosa.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX II.—1912.

NOTE.

IN the preface to the *Catalogue of the Library of the Royal Botanic Gardens*, which was issued as Volume III. of the *Additional Series* of the *Kew Bulletin*, it was stated that annual lists of future additions would be published in the *Bulletin*.

The present instalment contains the additions made to the Library by gift or purchase during the year 1911, with the exception of such current periodicals and annuals as continue sets already catalogued.

Like the Catalogue, the List is printed on one side of the page to allow of its being cut up. It is probable that many persons and institutions will make the Kew Catalogue the basis of their own, and will use the lists of additions to supply printed slips for fresh titles.

(24152—6a.) Wt. 189—808. 1125. 5/12. D & S.

CATALOGUE OF THE LIBRARY.

Additions received or incorporated during 1911.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX III.—1912.

NEW GARDEN PLANTS OF THE YEAR 1911.

The number of garden plants annually described in botanical and horticultural publications, both English and foreign, is now so considerable that it has been thought desirable to publish a complete list of them in the *Kew Bulletin* each year. The following list comprises all the new introductions recorded during 1911. These lists are indispensable to the maintenance of a correct nomenclature, especially in the smaller botanical establishments in correspondence with Kew, which are, as a rule, only scantily provided with horticultural periodicals. Such a list will also afford information respecting new plants under cultivation at this establishment, many of which will be distributed from it in the regular course of exchange with other botanic gardens.

The present list includes not only plants brought into cultivation for the first time during 1911, but the most noteworthy of those which have been re-introduced after being lost from cultivation. Other plants included in the list may have been in gardens for several years, but either were not described or their names had not been authenticated until recently.

In addition to species and well-marked varieties, hybrids, whether introduced or of garden origin, have been included where they have been described with formal botanical names. Mere cultural forms of well-known garden plants are omitted, for obvious reasons.

In every case the plant is cited under its published name, although some of the names are doubtfully correct. Where, however, a correction has appeared desirable, this is made.

The name of the person in whose collection the plant was first noticed or described is given where known.

An asterisk is prefixed to all those plants of which examples are in cultivation at Kew.

The publications from which this list is compiled, with the abbreviations used to indicate them, are as follows :—*B. K.*—Vaupel, Blühende Kakteen. *B. M.*—Botanical Magazine. *B. P.*—Bollettino

(24566—6a.) Wt. 189—808. 1125. 6/12. D & S. A

del R. Orto Botanico di Palermo. *B. T. O.*—Bullettino della R. Società Toscana di Orticultura. *Fedde, Repert.*—Fedde, Repertorium specierum novarum regni vegetabilis. *Gard.*—The Garden. *G. C.*—Gardeners' Chronicle. *Gfl.*—Gartenflora. *G. M.*—Gardeners' Magazine. *Jard.*—Le Jardin. *J. of H.*—Journal of Horticulture. *J. H. F.*—Journal de la Société Nationale d'Horticulture de France. *K. B.*—Bulletin of Miscellaneous Information, Royal Botanic Gardens, Kew. *M. D. G.*—Mitteilungen der Deutschen Dendrologischen Gesellschaft. *M. G. Z.*—Möllers Deutsche Gärtner-Zeitung. *M. K.*—Monatsschrift für Kakteenkunde. *N. B. G. Edinb.*—Notes from the Royal Botanic Garden, Edinburgh. *O. R.*—Orchid Review. *Orchis.*—Orchis. Beilage zur Gartenflora. *O. W.*—The Orchid World. *Pl. Wils.*—Plantae Wilsonianae, edited by C. S. Sargent. *R. H.*—Revue Horticole. *R. H. B.*—Revue de l'Horticulture Belge. *Sargent, T. & S.*—Sargent, Trees and Shrubs. *Späth Cat.*—L. Späth, General Nursery Catalogue. *T. H.*—La Tribune Horticole. *Veitch, N. H. P.*—J. Veitch & Sons, New Hardy Plants from Western China.

The abbreviations in the descriptions of the plants are :—*diam.*—Diameter. *ft.*—Foot or Feet. *G.*—Greenhouse. *H.*—Hardy. *H. H.*—Half-hardy. *in.*—Inches. *S.*—Stove.

Abies sibirica pendula. (*M. D. G.* 1911, 168.) Coniferae. H. A form with pendulous branches. (Graf von Zamoyski, Moloczki, Volhynien, Russia.)

Abies sitchensis Bruanti. (*Jard.* 1911, 25, f. 26.) H. A beautiful variety with semi-erect branches and glaucous-silvery leaves. (Bruant, Poitiers.) [*Picea sitchensis*, Carr., var.]

Acacia Deneufvillei. (*R. H. B.* 1911, 207; *B. T. O.* 1911, 222, f. 19.) Leguminosae. G. A hybrid between *A. podalyriaefolia* and *A. pycnantha*. (L. Winter, Bordighera.)

Acacia Hanburyana. (*B. T. O.* 1911. 220, f. 18; *R. H.* 1911, 318; *R. H. B*, 1911, 206, ff., as *A. Hamburyana*.) G. A hybrid between *A. podalyriaefolia* and *A. dealbata*. (L. Winter, Bordighera.)

Acacia hybrida. (*B. T. O.* 1911, 83, 120, f. 13.) G. A hybrid raised from seed obtained from a plant of *A. podalyriaefolia*. (G. B. Marsano, Nervi, Italy.)

Acacia Siebertiana. (*R. H. B.* 1911, 207; *B. T. O.* 1911, 223, f. 20.) G. A hybrid between *A. podalyriaefolia* and *A. pycnantha*, but differing from *A. Deneufvillei* in having almost lozenge-shaped instead of long leaves. (L. Winter, Bordighera.)

Acalypha. (*R. H.* 1911, 175–177, ff. 66–68; M. G. Z. 1911, 589–591, ff. 1–6.) Euphorbiaceae. S. The following garden hybrids, derived from *A. Sanderiana*, *A. Hamiltoniana*, *A. Godseffiana*, and *A. marginata*, are recorded :—*A. Dorotheae*, *A. Jursiana*, *A. Kalbreyerae*, *A. Ledieniana*, *A. Poschingerae*, *A. Ravenae*, *A. Siebertiana*, *A. Teupeliana*, and *A. Werneriana*. (H. A. Sandhack, Mehlem-on-Rhein; Gebrüder Teupel, Quedlinburg, Germany.)

Acer caudatum var. **multiserratum.** (*M. D. G.* 1911, 244.) Sapindaceae. H. Tree 30–50 ft. high. Leaves 3–5 in. across, 7-lobed; lobes sharply doubly serrate. Flowers in erect narrow panicles. Central China. (Arnold Arboretum, Boston, U.S.A.; H. A. Hesse, Weener, Hanover.)

Acer laevigatum. (*M. D. G.* 1911, 244.) H. A semi-evergreen tree up to 50 ft. high. Leaves oblong, 3–5 in. long, entire, leathery, glabrous, strongly net-veined. Fruits up to 1¾ in. long, in pendulous panicles. Himalaya; China. (H. A. Hesse, Weener, Hanover.)

Acer neglectum elongatum. (*M. D. G.* 1911, 423.) H. Leaves deeply 3-lobed, long, dark green, with red veins and petiole; lobes again slightly lobed, long-acuminate, undulate. (F. Graf von Schwerin, Wendisch-Wilmersdorf, Germany.)

Acer Pseudoplatanus globosum. (*M. D. G.* 1911, 424.) H. A densely branched form. (Geelhaar, Lawsken-Juditten, Germany.)

Acineta Moorei. (*B. M.* t. 8392.) Orchidaceae. S. A new species distinguished from *A. Hrubyana* by the

densely spotted flowers, which have distinctly broader lateral lobes to the lip. The flowers are subglobose, straw-coloured, with brown spots. South America. (Glasnevin B. G.)

Aciphylla latifolia. (*B. M.* t. 8407.) Umbelliferae. H. A robust almost glabrous herb. Stem 3–7 ft. high. Leaves thick, leathery, the radical ones long-stalked, ovate, twice pinnatisect, 1–2 ft. long; segments ovate-lanceolate, with somewhat spiny tips. Umbels compound, axillary and terminal, stalked, 2½–4 in. across; bracts and bracteoles linear. Flowers purple, in the plant figured male only. Calyx-teeth conspicuous. Auckland and Campbell Islands. (T. A. Dorrien Smith.)

Aciphylla Traversii. (*G. C.* 1911, l. 106.) H. Similar to *A. squarrosa*, but it does not grow so high, and the leaflets of the pinnate leaves are broader (¼–½ in. broad). Inflorescence about 2 ft. high. Flowers greenish. Chatham Islands. (Glasnevin B. G.)

Adenia venenata. (*B. T. O.* 1911, 289.) Passifloraceae. S. Perennial. Stem much thickened at the base. Branches slender, long, climbing. Leaves small, 5-lobed, pale green, glaucous, with a large gland at the base. Flowers dioecious. Corolla tubular, yellowish-white, 5-lobed. Arabia; Tropical Africa. (Palermo B. G.) [*Modecca.*]

Adioda. (*G. C.* 1911, l. 177.) Orchidaceae. G. *Adioda* "St. Fuscien" is the name given to a garden hybrid between *Ada aurantiaca* and *Cochlioda Noetzliana.* (H. Graire, Amiens.)

Aerides Crispianum. (*G. C.* 1911, xlix. 332.) Orchidaceae. S. "A dark rose-flowered species of the *A. Savageanum* class." Country not stated. (F. Sander & Sons.)

Aerides pallidum. (*O. R.* 1911, 231.) S. A graceful plant having white flowers with the apex of the spur yellowish. A re-introduction. Timor. (Stuart Low & Co.)

Agapanthus inapertus. (*B. T. O.* 1911, 187.) Liliaceae. G. Easily distinguished from *A. umbellatus* by having the funnel shaped flowers almost closed at the apex, and blackish-purple anthers with pale greyish-blue pollen. See *Bull. Soc. Bot. Genève*, 2me série, ii. 194, f. Eastern Transvaal. (W. Barbey, Pierrière, Geneva.)

***Alloplectus hirsutus.** (*K. B.* 1911, 346.) Gesneraceae. S. Herb about 1¾ ft. high, branched from the base. Stems erect, fleshy, shortly villous. Leaves oblanceolate, about 6 in. long, 2½ in. broad, more or less bullate; petiole ¾–1¼ in. long. Cymes sessile, 4–8-flowered. Calyx-segments ovate-lanceolate, about ¾ in. long. Corolla pale yellow, about 1¼ in. long; limb ⅔ in. across. Peru. (F. Sander & Sons; Kew.)

***Alloplectus pallidus.** (*K. B.* 1911, 346.) S. Herb about 1¾ ft. high, branched from the base. Stems erect, fleshy, shortly pilose. Leaves opposite, ovate-lanceolate, 6–10 in. long, 2¾–4¼ in. broad, crenate-serrate; petiole ⅓–¾ in. long. Cymes 3–6-flowered; pedicels about 1 in. long. Calyx-segments ovate, about 1 in. long. Corolla creamy-white, with purple blotches and lines inside the tube; tube including the spur 2 in. long; limb 1¼ in. across. Peru. (F. Sander & Sons; Kew.)

***Alnus sitchensis.** (*Späth Cat.* 1911–12, n. 148, 78.) Cupuliferae. H. A species which has long been confused with *A. Alnobetula.* A small tree with almost horizontal branches; bark greenish-grey, densely whitish-punctate. Leaves ovate, about 3 in. long, acute, sinuately lobed, doubly serrate, lustrous beneath. Stamens 4. Nut broadly winged. See *Sargent, Silva*, xiv. 61, t. 727. North-western America. (L. Späth, Berlin.)

***Amberboa muricata rosea.** (*R. H. B.* 1911, 29, f.) Compositae. H. A much-branched annual, 1¾–2 ft. high. Peduncles long. Flower-heads 2–2½ in. across, bright rose. (Haage & Schmidt, Erfurt.) [= *Volutarella muricata*, Benth. & Hook. f. var.]

Ampelopsis Tweedieana. (*B. T. O.* 1911, 247, f. 24.) Ampelidaceae. G. A climbing perennial. Leaves herbaceous, digitately 5-foliolate or sometimes 3-foliolate; segments obovate-lanceolate or lanceolate, acuminate or caudate, up to 6 in. long and 2½ in. broad, very irregularly incised-serrate; petiole about 2 in. long. Cymes 100–150-flowered. Corolla scarlet. This is *Cissus Tweedieana*, Planch. and *Vitis Tweedieana*, Baker. Argentina. (Florence B. G.)

***Amygdalus bucharica.** (*Späth Cat.* 1911–12, n. 148, 79.) Rosaceae. H. A small tree with slender spreading branches. Leaves small, elliptic to lanceolate, grey-green. Flowers not described. Turkestan. (L. Späth, Berlin.)

Anthurium hybridum florentianum. (*B. T. O.* 1911, 112, t. 3.) Araceae. S. The name given to a collection of garden hybrids obtained from *A. Andreanum*, *A. ornatum*, and other species or hybrids, remarkable for their large mostly brightly-coloured spathes. Short descriptions of 19 varieties are supplied. (R. Scuola di Pomologia e Orticoltura, Florence.)

Anthurium watermaliense. (*T. H.* 1911, 658.) S. Apparently an ally of *A. Andreanum*, remarkable in having spathes of a metallic black; they are furrowed, and the spadix is white, with a tinge of brown at base and apex. Andes of Colombia. (Duchesne & Lanthoine, Watermael, Belgium.)

Ariocarpus Lloydii. (*M. K.* 1911, 170.) Cactaceae. G. Usually confused with *A. fissuratus*, from which it differs in the size and shape of the tubercles, which are about ¾ in. broad at the base, the upper portion rounded, obtuse, broader than thick, the whole surface fissured, but not in definite bands as in *A. fissuratus*. See *Contr. U. S. Nat. Herb.* xiii. 308, t. 63. Mexico.

Arisaema consanguineum var. **giganteum.** (*B. T. O.* 1911, 227, f. 21.) Araceae. G. Differs from the type in being larger in all its parts. Petiole 2¾–4 ft. long. Leaf-segments 14–16 in. long, 2–2¼ in. broad, with a filiform appendage about 2½ in. long. Spathe about 8 in. long, with a filiform appendage about as long as the spathe itself. Himalaya; North China. (A. Biondi, Castelfalfi, Florence.)

Arisaema Fargesii. (*R. H.* 1911, 197, ff. 198–199.) G. A new species allied to *A. pictum*, under which name it is described in the list of 1910. Western China. (M. L. de Vilmorin, Les Barres, France.)

***Aristolochia kewensis.** (*G. C.* 1911, l. 300, suppl. ill.) Aristolochiaceae. S. A garden hybrid between *A. trilobata* and *A. brasiliensis*. (Kew.)

***Artemisia sacrorum viridis.** (*R. H.* 1911, 556, f. 218; *R. H. B.* 1911, 365, f.) Compositae. H. A vigorous-growing annual with pyramidal habit, elegant dark green foliage, and very numerous yellowish-white flower-heads produced in autumn. China. (F. C. Heinemann, Erfurt.)

Asparagus Hatcheri. (*G. C.* 1911, xlix. 170; *M. G. Z.* 1911, 99, f.) Liliaceae. S. Apparently a form of *A. plumosus* stronger in growth than the form *nanus*, with less delicate lateral branches, which are borne more regularly.

Asplenium decorum. (*G. C.* 1911, xlix. 300; *G. M.* 1911, 379.) Filices. G. A sport from *A. bulbiferum*. It is more compact in growth than the type. (H. B. May & Sons.)

Aster tataricus var. **Petersianus.** (*Gfl.* 1911, 218, t. 1591.) Compositae. H. Leaves narrower than in the type, stiffly hairy beneath, entire or slightly toothed and ciliate with stiff hairs. Flower-heads with pale blue ray-florets and yellow disc-florets. China. (Berlin-Dahlem B. G.)

Azalea Eeckhautei. (*R. H. B.* 1911, col. t.) Ericaceae. G. A garden hybrid between *A. linearifolia* and a form of *A. indica*. (L. Eeckhaute, St. Denis-Westrem, Belgium.) [*Rhododendron.*]

Beaumontia fragrans. (*G. C.* 1911, xlix. 306, suppl., ill.) Apocynaceae. G. An evergreen climbing shrub, with large opposite leaves and white fragrant shallow bell-shaped flowers about 4 in. across. Cochin-China. (E. D. Sturtevant, Los Angeles, California.)

Begonia Balmisiana var. **mitellifolia.** (*R. H.* 1911, 42, f. 13.) Begoniaceae. G. Rootstock tuberous. Stem simple, erect, fleshy, purplish, pubescent. Leaves petiolate, reniform, with rounded basal lobes, obscurely lobed, irregularly serrate, pubescent and dull green above, whitish-tomentose beneath; floral leaves very small, sessile; petiole reddish-tomentose. Inflorescence a terminal raceme, with the upper flowers male and 2 to 4 of the lower ones female. Pedicels rather long, with a cluster of very small bulbils at the base of each. Flowers pale rose, small, the male with 2 sepals and 2 petals. Fruits unequally winged. Mexico. (Montpellier B. G.)

***Berberis polyantha.** (*Veitch, N. H. P.* 1911, 4, f.) Berberidaceae. H. A deciduous shrub 5–6 ft. high. Leaves obovate, bright green, borne in clusters of about 8 each. Flowers yellow. Fruits coral red. Western China. (J. Veitch & Sons.)

***Berberis verruculosa.** (*K. B.* 1911, 327; *G. C.* 1911, l. 312.) H. A dwarf evergreen bush. Young stems densely covered with small dark warty excrescences. Leaves densely

arranged in fascicles, elliptic-oblong, ½–1½ in. long, leathery, spiny. Flowers golden-yellow, solitary or in few-flowered fascicles. Fruit black, with a blue bloom. Western China. (J. Veitch & Sons.)

*Betula alnoides pyrifolia. (*Veitch, N. H. P.* 1911, 9.) Cupuliferae. H. A deciduous tree, 20–40 ft. high, with ovate acuminate leaves resembling those of a *Pyrus*. Central and Western China. (J. Veitch & Sons.)

Bidens atrosanguinea hybrida. (*R. H. B.* 1911, 29, f.) Compositae. H. H. A garden hybrid between *B. atrosanguinea* (*Dahlia Zimapani*) and *Dahlia Merckii*. (Haage & Schmidt, Erfurt.)

Bifrenaria melanopoda. (*O.R.* 1911, 68.) Orchidaceae. G. A miniature species, with a tuft of angular pseudobulbs ½–¾ in. high. Leaves rather narrow, 2–4 in. long. Scapes short, slender, bearing 1 or few flowers. Sepals and petals light green, sometimes tinged with brown, about ½ in. long. Lip flabellate, fringed, white, with rose-purple veins. Spur short, obtuse. A re-introduction. It was in cultivation in 1855. Brazil. (J. O'Brien.)

*Biophytum Foxii. (*K. B.* 1911, 343.) Geraniaceae. G. An erect herb. Stem about 2 in. high, pilose. Leaves 8, in a whorl at the apex of the stem, 1½–3⅓ in. long.; leaflets in 3 to 6 pairs, the largest ⅝–1⅓ in. long and ½–1 in. broad. Peduncle 1⅝ in. long, many flowered. Corolla white; tube 3 lin. long; lobes reflexed, oblong-obovate, about ⅛ in. long. Peru. (Kew.)

Bougainvillea aurantiaca. See B. Lindleyana.

Bougainvillea Lindleyana. (*B. T. O.* 1911, 80.) Nyctaginaceae. S. A very hairy climbing plant, with strong curved spines. Leaves obovate-rounded, acute, very hairy, slightly undulate on the margin. Bracts rather large, elliptic, shortly acuminate, cinnabar-coloured. This, of which *B. aurantiaca*, Hort. is given as a synonym, is said to be allied to *B. pomacea*, a Brazilian species. *B. Lindleyana* is referred to as a garden name, but the origin of the plant is not stated. (Palermo B. G.)

Brasso-cattleya Abekenii. (*O. W.* i. 223.) Orchidaceae. G. A garden hybrid between. *B.-c. Digbyano-Gigas* and *Cattleya Luddemanniana*. (Charlesworth & Co.)

Brasso-cattleya amabilis. See B.-c. Vilmoriniana.

Brasso-cattleya gesneriaeflora. (*J. H. F.* 1911, 565.) S. A garden hybrid between *Brassavola fragrans* and *Cattleya maxima*. (C. Maron, Brunoy, France.)

Brasso-cattleya Vilmoriniana. (*G. C.* 1911, xlix. 98, 146; *O. R.* 1911, 95.) G. A garden hybrid between *Cattleya Mossiae* and *B.-c. Leemanniae* [= "Mrs. J. Leemann"]. (C. Maron, Brunoy, France.) [Syn. *B.-c. amabilis*; G. C. 1911, xlix. 146. *Laelio-cattleya Vilmoriniana*; R. H. 1911, 75.]

Brasso-laelia Canari. (*J. H. F.* 1911, 452.) Orchidaceae. G. A garden hybrid between *Brassavola Digbyana* and *Laelia xanthina*. (C. Béranek, Paris.)

Brunsdonna Sanderae alba. (*G. C.* 1911, l. 210.) Amaryllidaceae. G. or H. H. Apparently a garden hybrid between a *Brunsvigia* and *Amaryllis Belladonna*. (F. Sander & Son.) [=*Amaryllis Parkeri alba*.]

*Buddleia officinalis. (*G. C.* 1911, xlix. 201, suppl. ill.; *B. M.* t. 8401.) Loganiaceae. G. Shrub, 3–8 ft. high, with densely grey-pubescent branches. Leaves oblong-lanceolate to linear-lanceolate, about 4 in. long, ⅓–1 in. broad, densely grey-pubescent beneath; petiole 2½ lin. long. Flowers in terminal rather crowded panicle-like inflorescences 3–12 in. long. Corolla pale or very pale lilac, with orange throat; tube about 5 lin. long; limb 3 lin. across, 4-lobed. Northern and Central China. (J. Veitch & Sons; Arnold Arboretum, Boston, U.S.A.)

Buddleia variabilis amplissima. (*R. H.* 1911, 117.) H. Inflorescences very large, 3 or 5 together. Flowers large, deep violet, with a yellow eye. (V. Lemoine & Son, Nancy.)

Bulbophyllum chrysocephalum. (*Orchis*, 1911, 60, ff. 31–39.) Orchidaceae. S. A dwarf plant resembling *B. angustifolium* in habit. Pseudobulbs ovoid, compressed, about ⅔ in. long, 1-leaved. Leaves elliptic-ligulate, scarcely 4 in. long. Peduncle 1¼–1¾ in. long. Flowers yellow, golden-yellow at the tips of the segments, larger than in *B. angustifolium*. Probably South-eastern Asia. (Baron M. von Fürstenberg, Hugenpoet, Essen, Germany.)

Bulbophyllum cylindraceum. (*G. C.* 1911, xlix. 3, f. 1.) S. Pseudobulbs rudimentary. Leaves oblong-lanceolate, from half as long to nearly as long as the inflorescences. Flowers variously coloured from pink to deep purple, flattened, in dense cylindrical spikes. Himalaya; Burma. (F. Sander & Sons.) [Syn. *B. imbricatum*, Griff., not of Lindley.]

Bulbophyllum lepidum. (*Orchis*, 1911, 52, col. t.) S. Similar to *Cirrhopetalum Cumingii*. Pseudobulbs ovate, 4-angled, about ¾ in. long, 1-leaved. Leaves lanceolate, 5½–7 in. long, 1–1¾ in. broad, obtuse. Peduncle slender, about 8 in. long, dark red-brown. Inflorescence umbel-like, the flowers forming a half or three-quarters of a circle. Flowers whitish-yellow, yellow and brown-red. Lateral sepals coherent, lanceolate, about 1 in. long. Petals and lip very small. Java; Borneo. (Breslau B. G.)

***Caladium pubescens.** (*B. M.* t. 8402.) Araceae. S. A new species distinct from those already in cultivation in being pubescent. Leaves ovate-cordate, 8–12 in. long, 3½–9 in. broad; petiole 4–13 in. long. Peduncle about 8 in. long. Spathe 5–6 in. long; tube pale green; blade white inside, greenish-white outside. Peru. (F. Sander & Sons; Kew.)

Calanthe Cooksoniae. (*G. C.* 1911, 1. 350, f. 148; *O. W.* ii. 69, 70, f.) Orchidaceae. S. A garden hybrid between *C. Harrisii* and *C. vestita rubro-oculata gigantea*. (Mrs. N. C. Cookson.)

***Campanula acutangula.** (*G. C.* 1911, 1. 220, f. 104.) Campanulaceae. H. A dwarf species, with trailing stems arising from a rosette of petiolate leaves resembling those of the ivy. Stem-leaves small, rounded, toothed. Flowers solitary on each stem, rather large, star-like, purplish-blue. The species is closely allied to *C. Morettiana*, but the plant is not so hairy and the flowers are flatter. Northern Spain. (Kew.) [*C. arvatica*, Lag.]

Campanula longistyla var. **parviflora.** (*R. H.* 1911, 548, f. 215 & col. t.) H. Flowers slightly smaller than in the type. Caucasus. (Cayeux & Le Clerc, Paris.)

***Carpinus polyneura.** (*K. B.* 1911, 327.) Cupuliferae. H. An elegant tree reaching a height of 30 ft., remarkable in having its linear silky stipules persistent through the winter. Leaves ovate, acute, slightly cordate at the base, 1–2½ in. long, ½–1 in. broad, toothed, flat, scarcely plicate, glabrescent above, silky-downy on the principal veins beneath. Central China. (Kew.)

***Catalpa Fargesii.** (*Veitch, N. H. P.* 1911, 9.) Bignoniaceae. H. A deciduous tree, 40 ft. high. Leaves 5-lobed, glabrous, deep green. Flowers pale purple. Western China. (J. Veitch & Sons.)

Catasetum Cliftonii. (*G. C.* 1911, 1. 32, 96; *G. M.* 1911, 593.) Orchidaceae. S. Probably a form of *C. Bungerothii*. It differs in having a distinctly 3-lobed lip, with a large prominent triangular orange-coloured callus. Flowers greenish to pale yellow. Lip slightly fimbriate. (Sir Trevor Lawrence; Sir J. Colman.)

Catasetum Colmaniae. (*G. C.* 1911, 1. 18.) S. "A fine yellow flower with a trilobed lip stained with deep crimson." (Sir J. Colman.)

Catasetum scurra. (*O. R.* 1911, 36.) S. Very nearly allied to *C. Warscewiczii*, and possibly a white variety of that species. It has a hanging inflorescence of about 5 flowers which are white with green veins, becoming violet at the base of the spur inside. A re-introduction. Demerara. (Mrs. F. B. Lipscomb.)

Cattleya Alwynii. (*O. R.* 1911, 348.) Orchidaceae. G. A garden hybrid between *C. Adonis* and *C. amabilis*. (C. Alwyn Harrison.)

Cattleya Blackii. (*G. C.* 1911, xlix. 45.) G. A garden hybrid between *C. Mendelii alba* and *C. Gaskelliana alba*. (R. G. Thwaites.)

Cattleya Butleri. (*O. R.* 1911, 368.) G. A garden hybrid between *C. citrina* and *C. Schilleriana*. (W. W. Butler.)

Cattleya Hassallii. (*G. C.* 1911, 1. 282.) G. A garden hybrid between *C. labiata* and *C. Frederickiae* ("Empress Frederick.") (Hassall & Co.)

Cattleya Holdenii. (*O. R.* 1911, 94.) G. A garden hybrid between *C. intermedia alba* and *C. Warneri alba*. (J. J Holden.)

Cattleya Juliettae. (*T. H.* 1911, 537.) G. A garden hybrid between *C. Mossiae alba* and *C. Warneri alba*. (F. Lambeau, Brussels.)

Cattleya lythamensis. (*G. C.* 1911, 1. 245.) G. A garden hybrid between *C. bicolor Grossii* and *C. Gaskelliana.* (S. Larkin.)

Cattleya micans. (*G. C.* 1911, 1. 137.) G. A garden hybrid between *C. Warscewiczii* and *C. Wavriniana.* (F. Sander & Sons.)

Cattleya Mossiae aureola. (*G. C.* 1911, xlix. 376; *G. M.* 1911, 452.) G. Flowers large, blush-white; labellum broad, crimped, having the central area tinged and veined with chrome-yellow and with a few purple markings. (Sir Trevor Lawrence.)

Cattleya Mossiae Floryae. (*G. C.* 1911, xlix. 376.) G. Flowers pure white, with a slight pink shade on the lip, and of excellent shape. (Tracy's Nursery.)

Cattleya Trianae brunoyensis. (*J. H. F.* 1911, 565.) G. Sepals and petals mauve, the latter 4½ in. long and about 3½ in broad. Lip of very fine form, violet-purple at the base, yellow in the throat. (C. Maron, Brunoy, France.)

Cattleya Trianae Goodsonii. (*G. C.* 1911, xlix. 107.) G. A richly-coloured variety. Petals flushed with deep rose. (H. S. Goodson.)

Cattleya versicolor. (*O. W.* ii. 14.) G. A garden hydrid between *C. velutina* and *C. Mossiae.* (F. Sander & Sons.)

Cattleya vivicans. (*G. C.* 1911, l. 137.) G. A garden hybrid between *C. velutina* and *C. Fabia.* (F. Sander & Sons.)

***Celastrus hypoglaucus.** (*Veitch, N. H. P.* 1911, 9.) Celastraceae. H. A deciduous species, having the young wood covered with a waxy bloom. Leaves large, deep pea-green above, glaucous beneath. Central China. (J. Veitch & Sons.)

***Celmisia Brownii.** (*Gard.* 1911, 274; *G. M.* 1911, 610.) Compositae. G. One of the largest-growing species. Leaves petiolate, leathery, 10–16 in. long, 3 in. broad, tomentose beneath. Flower-heads 3 in. across. New Zealand. (Kew.)

***Celmisia hieracifolia.** (*G. M.* 1911, 610.) G. A small-growing species. Leaves obovate-oblong to linear-oblong, 1–5 in. long, ½–1 in. broad, with a buff-coloured tomentum beneath. Flower-heads about 1½ in. across. New Zealand. (Kew.)

***Celmisia holosericea.** (*Gard.* 1911, 274, f.; *G. M.* 1911, 610.) G. A tufted free-flowering species with long lanceolate leaves, which are deep green above and white-silky beneath. Peduncles about 18 in. long. Flower-heads 3 in. across, white, with a yellow disc. New Zealand. (Kew.)

***Celmisia Mackaui.** (*G. M.* 1911, 610, as *C. Mackayi.*) G. Leaves linear-lanceolate, acuminate, 6-20 in. long, 2–4 in. broad, glabrous and green on both surfaces. Flower-heads about 2 in. across, with long white ray-florets. New Zealand. (Kew.)

***Celmisia petiolata.** (*Gard.* 1911, 274; *G. M.* 1911, 610.) G. Robust in growth. Leaves narrow, almost membranous, with long slender purplish petioles. Flower-heads white, with yellow disc. New Zealand. (Kew.)

***Celmisia verbascifolia.** (*G. M.* 1911, 610.) G. A strong-growing handsome species. Leaves leathery, lanceolate to oblong-lanceolate or spathulate-lanceolate, 8–13 in. long, covered beneath with whitish down. Flower-heads about 4 in. across. New Zealand. (Kew.)

***Celmisia viscosa.** (*G. M.* 1911, 610.) G. A tufted plant, somewhat like a *Primula* in habit. Leaves short, narrow, erect, grooved, viscid. Flower-heads about ½ in. across, with short ray-florets. New Zealand. (Kew.)

Celtis Biondii. (*M. D. G.* 1911, 241.) Urticaceae. H. Tree or shrub, branched from the base. Leaves broader than in *C. Bungeana*, dark green above, cream-grey beneath, deeply serrate, rather long-stalked. Fruits dark blue, small, round, long-stalked. Central China. (C. Sprenger, Naples.)

Celtis Bungeana. (*M. D. G.* 1911, 241.) H. A small densely leafy tree, with slender branches. Leaves oblong-rounded, deeply toothed or sometimes entire at the base, shining green above, somewhat cream-coloured beneath, beautifully net-veined. Fruits round, bluish, mostly solitary, long-stalked. China. (C. Sprenger, Naples.)

Cereus coerulescens var. **melanacanthus.** (*B. K.* t. 127.) Cactaceae. G. Distinguished as a variety by its

large shining black spines. Argentina. (Berlin-Dahlem B. G.)

Cereus Damazioi. (*M. K.* 1911, 91, 102.) G. Dwarf, articulate-branched, green. Joints globose or elliptic, small. Ribs 8–11, subcrenate. Areoles rather crowded, small, tomentose. Spines numerous, small, not pungent, dark purple or white. Flowers lateral, relatively large, funnel-shaped; outer segments linear-lanceolate, green; inner narrowly lanceolate, white. Brazil. (Berlin-Dahlem B. G., etc.)

Ceropegia Barklyi × Rendallii. (*G. C.* 1911, 1. 382.) Asclepiadaceae. S. A garden hybrid. (W. E. Ledger.)

***Ceropegia Rothii.** (*G. C.* 1911, 1. 382; *M. K.* 1911, 8.) S. A garden hybrid between *C. Sandersonii* and *C. radicans*. (P. Roth, Bernburg, Germany; W. E. Ledger.)

Chamaecyparis Lawsoniana knowfieldensis. (*M. D. G.* 1911, 172.) Coniferae. H. A compact-growing form, with fern-like crested and drooping branches. (H. den Ouden & Son, Boskoop, Holland.)

Chelone barbata vars. (*R. H.* 1911, 567–568.) Scrophulariaceae. H. The following varieties are described:—*amarantina*, *aurora*, *gloriosa*, *multiflora rosea*, *purpurea* and *salmonea*. (E. Gauguin, Orleans.) [*Pentstemon barbatus*, Nutt., vars.]

Chrysanthemum multiflorum. (*Jard.* 1911, 344.) Compositae. H.? This is stated to be a cross between a *Chrysanthemum* with single flowers and *C. Pallasianum*. It has greenish-white flowers. (Cayeux & Le Clerc, Paris.)

Cirrhopetalum caudatum. (*O. R.* 1911, 318.) Orchidaceae. S. A dwarf species with ovoid pseudobulbs borne about an inch apart on a creeping rhizome. Leaves ovate. Scapes scarcely more than 1 in. high. Flowers whitish, arranged in umbels. Dorsal sepals short; lateral sepals tail-like, about as long as the scapes. North-eastern Himalaya; Khasia Hills. (Glasnevin B. G.)

***Cladothamnus pyrolaeflorus.** (*B. M.* t. 8353.) Ericaceae. H. Shrub, 4–10 ft. high. Leaves almost sessile, lanceolate or obovate-lanceolate, ¾–1 in. long, ⅓ ⅖ in. broad. Flowers terminal, usually solitary, on leafy branches. Calyx-lobes leafy, lanceolate or linear-oblong, about ⅖ in. long. Petals oblong, blunt, ⅗ in. long, yellowish-red or yellowish-rose. North-west America. (T. Smith, Newry.)

***Clematis aristata** var. **Dennisae.** (*B. M.* t. 8367.) Ranunculaceae. G. Another name for the plant included in the list of 1907 as *C. Sanderi*.

***Clematis chrysocoma.** (*B. M.* t. 8395.) H. H. Allied to *C. montana*, but it is a shrub of low stature, with erect or decumbent branches, and has a coarser and denser pubescence. The flowers, which are abundantly produced from the old wood, are white, with a rosy margin, about as large as those of *C. montana*. Western China. (M. L. de Vilmorin, Les Barres, France; Kew.)

***Clematis Durandi.** (*G. M.* 1911, 592.) H. Of garden origin. It is possibly a hybrid between *C. integrifolia* and a form of *C. lanuginosa*, and has been catalogued by Simon-Louis frères, Plantières, Metz, as a variety of the first named. It is robust in growth, with larger leaves than are usual in the garden varieties, and bluish-purple flowers 4 in. across.

***Clematis Jouiniana.** (*Späth Cat.* 1911–12, n. 148, 87.) H. A garden hybrid between *C. Davidiana* and *C. Vitalba*. (L. Späth, Berlin.)

Clematis Thunbergii. (*G. C.* 1911, 1. 253, f. 112.) An ornamental species forming long graceful growths which produce flowers at all the nodes. Leaves subbipinnate, glabrous; leaflets distant, stalked, broadly ovate, acuminate, few-toothed. Panicles much longer than the leaves. Flowers white, fragrant. Sepals spreading, lanceolate, acuminate. South Africa. (Cambridge B. G.)

Clitoria albiflora. (*B. P.* vii. 97; *Fedde, Repert.* ix. 251.) Leguminosae. S. A dwarf climbing herb. Leaves rather long-stalked, 5-foliolate; leaflets ovate, nearly 1 in. long, ¾ in. broad. Flowers solitary. Calyx-lobes broadly lanceolate, about ½ in. long. Corolla white, with the standard yellowish-white outside and marked by a citron-yellow blotch in the middle inside, twice as long as the calyx. Italian Somaliland. (Palermo B. G.)

Cnicus rhaphilepis. (*M. G. Z.* 1911, 558, f.) Compositae. H.? A handsome plant with deeply laciniate spiny-toothed leaves about 2 ft. long and grey-tomentose beneath. Stem brown-red, much-branched. Flower-heads 3–3½ in. long, with scarlet spine-

tipped involucral bracts. Flowers scarcely exserted. Filaments carmine. Mexico. (Darmstadt B. G.)

Cochlioda Floryi. (*O. R.* 1911, 144.) Orchidaceae. G. Supposed to be a natural hybrid between *C. Noetzliana* and *C. rosea*. Peru. (Tracy's Nursery.)

Coelogyne burfordiense. (*G. C.* 1911, xlix. 333; *G. M.* 1911, 414.) Orchidaceae. S. A garden hybrid between *C. asperata* and *C. pandurata*. (Sir Trevor Lawrence.)

Coelogyne chrysotropis. (*Orchis*, 1911, 58, ff. 17–22.) S. Pseudobulbs cylindrical-conical, about 2 in. long, 2-leaved. Leaves elliptic, about 6 in. long, 1¼–1¾ in. broad in the middle. Scape much shorter than the leaves, few-flowered. Sepals oblong, about 1 in. long. Petals narrowly linear, 1 in. long. Lip oblong and concave at the base, 3-lobed in the middle, as long as the sepals; lateral lobes erect, ovate-triangular, ciliate-fimbriate. Sumatra. (Glasnevin B. G.)

Colchicum Parkinsonii var. **flavum.** (*G. C.* 1911, 1. 270.) Liliaceae. H. A provisional name for a plant differing from *C. Parkinsonii* in having primrose-yellow flowers with rosy-purple markings towards the base of the segments. Syria. (A. Perry.)

Collabium nebulosum. (*G. C.* 1911, xlix. 97.) Orchidaceae. S. Stems fleshy, about 2 in. long, 1-leaved. Leaves broadly ovate, acuminate; petiole rounded. Scape stout, erect, about 2 ft. high. Flowers numerous, in scattered irregular whorls, about ½ in. long, spurred. Sepals and petals greenish, reddish on the margin. Lip 3-lobed, white, slightly fringed. Java. (Sir J. Colman.)

***Columnea gloriosa.** (*B. M.* t. 8378.) Gesneraceae. S. A new species and perhaps the finest yet introduced. An epiphytic perennial herb. Stems prostrate or pendent. Leaves ovate or ovate-oblong, ¾–1¼ in. long, ½–⅔ in. broad, shortly stalked. Flowers axillary, solitary. Corolla scarlet and yellow, 2½–3 in. long; tube slightly more than 1 in. long; limb distinctly 2-lipped; upper lip hood-like, very broad, 3-lobed; lower lip undivided, oblong, spreading. Costa Rica. (Kew.)

Corchorus Baldaccii. (*B. P.* vii. 180; *Fedde, Repert.* ix. 347.) Tiliaceae. S. A perennial, woody at the base. Leaves petiolate, linear-elliptic, ⅔–1 in. long, 2–2½ lin. broad, stellate-pilose above, densely whitish-tomentose beneath. Flowers solitary, axillary, minute. Italian Somaliland. (Palermo B. G.)

***Cornus Kesselringii.** (*Späth Cat.* 1911–12, n. 148, 88.) Cornaceae. H. Remarkable for the brown-black bark of its branches and its dark brown young leaves, the latter changing to a deep green. Probably East Asia. (L. Späth, Berlin.)

***Cornus paucinervis.** (*G. C.* 1911, 1. 94, f. 45.) H. A bushy evergreen, up to 5 or 6 ft. high. Leaves lanceolate, shortly petiolate, about 2 in. long, ⅓–½ in. broad, slightly hairy. Flowers creamy white, ½ in. across or less, in numerous flat terminal clusters about 3 in. across. China. (Hon. Vicary Gibbs.)

Coryanthes Balfouriana. (*O. W.* ii. 28, ff.) Orchidaceae. S. Similar to a *Stanhopea* in habit, with a long pendulous scape bearing 2 or 3 large and curiously shaped flowers. Sepals and petals delicate in texture. Lip large, the lower part bucket-shaped. The species appears to be closely allied to *C. maculata*. Peru. (F. Sander & Sons.)

Cotoneaster ignava. (*Späth Cat.* 1911–12, n. 148, 89.) Rosaceae. H. Allied to *C. nigra*. Growths ascending, then nodding. Leaves broadly ovate, dull green above, pale grey-green beneath. Flowers reddish-white, in nodding clusters. Fruits purple-violet, as large as a pea. Turkestan. (L. Späth, Berlin.)

Cotoneaster Silvestrii. (*M. D. G.* 1911, 242.) H. A tall deciduous shrub. Leaves ovate, shining green above, densely hairy and cream-coloured beneath. Inflorescences few-flowered. Fruits roundish-oval, orange-coloured. Central China. (C. Sprenger, Naples.)

***Crassula globosa.** (*K. B.* 1911, 356.) Crassulaceae. G. Distinct in having subglobose leaves, resembling small marbles flattened on one side, arranged in about three pairs on each growth. Flowers very small, white, in small crowded heads. Cape Colony. (Kew.)

***Crassula humilis.** (*K. B.* 1911, 357.) G. Closely allied to *C. globosa*, but its leaves are deltoid-ovate, rather flat or convex on the upper side and obtusely keeled on the back. Flowers white, very small, sessile, in crowded heads. Cape Colony. (Kew.)

***Crataego-mespilus Asnieresii.** (*Gard.* 1911, 310, f.; *K. B.* 1911, 268, t.) Rosaceae. H. A graft hybrid

between *Crataegus Oxyacantha* and *Mespilus germanica*, produced by a different branch of the same tree from which *C.-m. Dardari* was obtained. It was distributed some years ago by Simon-Louis of Metz under the name of *C.-m.* "Monsieur Jules d'Asnières."

Crataegus atrocarpa. (*Späth Cat.* 1911–12, n. 148, 90.) Rosaceae. H. Near *C. chlorosarca.* A small tree with short thorns, villous branchlets, leaves and inflorescences, and black fruits with green flesh. Country not stated. (L. Späth, Berlin.)

Crataegus Maximowiczii. (*Späth Cat.* 1911–12, n. 148, 91.) H. Differs from *C. chlorosarca* in having very hairy leaves and inflorescences, and black fruits with green flesh which are later in ripening. Manchuria. (L. Späth, Berlin.)

Crotalaria Tropeae. (*B. P.* vii. 174; *Fedde, Repert.* ix. 320.) Leguminosae. S. An erect or prostrate annual. Leaves 3-foliolate; leaflets oblong-linear, entire. Racemes lateral, often 20-flowered or more. Flowers rather small, yellowish, with a golden-yellow standard. Italian Somaliland. (Palermo B. G.)

***Cyanthus microphyllus.** (*G. C.* 1911, xlix. 42, f. 23.) Campanulaceae. H. This is the correct name for the plant included in the list of 1905 as *C. linifolius.*

Cymbidium Alexanderi. (*G. C.* 1911, xlix. 174; *G. M.* 1911, 222.) Orchidaceae. G. A garden hybrid between *C. eburneo-Lowianum* and *C. insigne.* (Sir G. L. Holford.)

Cymbidium glebelandsense. (*G. C.* 1911, xlix. 14.) G. A garden hybrid between *C. Schroederi* and *C. insigne Sanderi.* (J. Gurney Fowler.)

Cymbidium Gottianum. (*G. C.* 1911, xlix. 174, 180, f. 81; *G. M.* 1911, 222.) G. A garden hybrid between *C. eburneum* and *C. insigne.* (F. Sander & Sons.)

Cymbidium langleyense. (*G. C.* 1911, xlix. 146, f. 66.) G. A garden hybrid between *C. Lowianum* and *C. Devonianum.* (J. Veitch & Sons.) [Syn. *C. Veitchii*; G. C. 1911, xlix. 142; G. M. 1911, 188 f.]

Cymbidium Lawrenceanum. See **C. Pauwelsii.**

Cymbidium Pauwelsii. (*G. C.* 1911, xlix. 108.) G. A garden hybrid between *C. insigne* and *C. Lowianum concolor.* (Th. Pauwels & Co., Meirelbeke, Ghent.) [Syn. *C. Lawrenceanum*; G. M. 1911, 169.]

Cymbidium Veitchii. See **C. langleyense.**

Cypripedium Beyrodtianum. (*Orchis*, 1911, 2.) Orchidaceae. S. A natural hybrid. Parentage not recorded. Siam. (O. Beyrodt, Marienfelde, Berlin.)

Cypripedium Curtisii × vexillarium. (*O. R.* 1911, 314.) S. A garden hybrid. (A. J. Keeling & Sons.) [*Paphiopedilum.*]

Cypripedium glauc-insigne. (*G. C.* 1911, xlix. 146.) S. A garden hybrid between *C. glaucophyllum* and *C. insigne*, Harefield Hall variety. (Th. Pauwels & Co., Meirelbeke, Ghent.) [*Paphiopedilum.*]

Cypripedium grittletonense. (*G. C.* 1911, l. 381, as *C. grittlelonense.*) S. A garden hybrid between *C. Stevensii* and *C. Curtisii.* (Lady Audley Neeld.) [*Paphiopedilum.*]

Cypripedium Höchbergianum. (*M. G. Z.* 1911, 256, f.) S. A garden hybrid between *C. Mastersianum* and *C. glaucophyllum.* (Frankfort Palm Garden.) [*Paphiopedilum.*]

Cypripedium insigne Hurrellianum. (*O. W.* i. 187.) S. A distinct form. Dorsal sepal flat, greenish-yellow, suffused with reddish-brown on the basal half, white at the apex. (Lager & Hurrell, Summit, N.J., U.S.A.) [*Paphiopedilum.*]

Cypripedium insigne Lagerae. (*O. W.* i. 187.) S. Dorsal sepal reddish-brown, suffused towards the edges with greenish-yellow, and with 4 or 5 pink marks at the extreme upper part of the blotch, margined with pure white. (Lager & Hurrell.) [*Paphiopedilum.*]

Cypripedium luteum. (*G. C.* 1911, xlix. 402, f. 178; *O. R.* 1911, 221.) H. Stem erect, stout, 8–12 in. high, covered with a short curly brown pubescence. Leaves 5 or 6 to each stem, subsessile, ovate, 2½–8 in. long, 1¼–3¼ in. broad, prominently nerved, pubescent. Flowers yellow, 2½–3¾ in. across. Dorsal sepal ovate, 1½–2 in. long. Petals ovate, 1¼–1½ in. long, spreading and slightly reflexed. Lip 1½–2 in. long, 1–1¼ in. broad. Central and Western China. (Arnold Arboretum, Boston, U.S.A.)

Cypripedium mancunium. (*G. C.* 1911, l. 403.) S. A garden hybrid between *C. Harrisianum superbum* and *C. Leeanum.* (Rev. J. Crombleholme.) [*Paphiopedilum.*]

Cypripedium Overtonii. (*G. C.* 1911, l. 402.) S. A garden hybrid between *C. fulshawense* and *C. Leeanum* "Corona." (R. L. Overton.) [*Paphiopedilum.*]

Cypripedium Seymourae. (*G. C.* 1911, l. 443.) S. A garden hybrid between *C. Leeanum Clinkaberryanum* and *C. Fairrieanum.* (D. McLeod.) [*Paphiopedilum.*]

Cypripedium Sladdenii. See **Paphiopedilum Sladdenii.**

Cypripedium speciosum. (*B. M.* t. 8386; *K. B.* 1911, 207.) H. This has been in cultivation for several years, but has been confused with *C. macranthum* and *C. Thunbergii.* Under the latter name it is included in the list of 1908. Japan.

Datura alba var. **africana.** (*B. P.* vii. 108; *Fedde, Repert.* ix. 253.) Solanaceae. H.H. Distinguished from the type by its larger leaves, longer calyx, and by the corolla being glabrous outside. Italian Somaliland. (Palermo B. G.)

***Deinanthe caerulea.** (*B. M.* t. 8373.) Saxifragaceae. H. A new species which was included in the list of 1903 under the name of *D. bifida.* It differs from the true *D. bifida* in the pubescence of the leaves, in having a paniculate inflorescence without involucre, blue instead of creamy-white or pure white flowers, and a capsule which is deeply conical in the upper part. Central China. (H. J. Elwes.)

Dendrobium Annae. (*G. C.* 1911, l. 57; *O. R.* 1911, 288.) Orchidaceae. S. Allied to *D. mutabile.* Flowers large, blush-white, with an orange disc to the lip. Java; Sumatra. (Sir Trevor Lawrence.)

Dendrobium delicatulum. (*G. C.* 1911, xlix. 142.) S. Closely allied to *D. speciosum.* Stems slender, bulbiform at the base. Leaves 3 or 4 at the top of the stem, 3–5 in. long, ¾–1¼ in. broad, rather leathery, emarginate. Racemes 7–8 in. long, with 8 or 9 fragrant white flowers speckled with purple on the lip. Sepals and petals 6–8 lin. long. Lip with a very short apiculate middle lobe. See *Bailey, Queensl. Flora,* 1527. Queensland. (Sir Trevor Lawrence.)

Dendrobium Faulhaberianum. (*Orchis,* 1911, 58, ff. 1–9.) S. Allied to *D. aduncum.* Stems several, slender, up to 20 in. high, leafy. Leaves elliptic-ligulate or elliptic, 2½–3¾ in. long. Inflorescences lateral, spreading, 5–8-flowered. Flowers violet-rose. Sepals ¾ in. long, oblong- or ovate-lanceolate, the lateral ones forming a mentum scarcely ½ in. long. Petals elliptic-lanceolate, ¾ in. long. Lip shortly clawed, with the blade concave and subquadrate at the base and slightly 3-lobed above the middle, ⅔ in. long. Hainan. (H. Goldschmidt, Essen, Germany.)

Dendrobium flaviflorum. (*O. R.* 1911, 239.) S. This introduction from Formosa proves to be the same as the widely distributed *D. aurantiacum,* Rchb. f. in G. C. 1887, ii. 98.

Dendrobium mirandum. (*G. C.* 1911, xlix. 141.) S. A garden hybrid between *D. Wiganiae* and *D. Thwaitesiae.* (R. G. Thwaites.)

Dendrobium oakwoodiensis. (*G. C.* 1911, xlix. 141.) S. A garden hybrid derived from *Dendrobium* "T. B. Haywood." (Mrs. N. Cookson.)

Dendrobium Phalaenopsis Colmanii. (*G. C.* 1911, l. 247.) S. A large-flowered form. (W. R. Lee.)

Dendrobium Schuetzei. (*G. C.* 1911, l. 42.) S. A new species of the *D. Dearei* group. Flowers very large, white. Petals obovate-orbicular. Lip strongly 3-lobed; side lobes broadly rounded; front lobe broadly obovate or nearly orbicular, with a distinct apiculus. Country not stated. (F. Sander & Sons.)

Dendrobium undulatum Broomfieldii. (*O. R.* 1911, 316.) S. Flowers pale greenish-yellow and rather smaller than in the type. Northern Australia. (Sir Trevor Lawrence.)

Deutzia crenata latifolia. (*R. H.* 1911, 117.) Saxifragaceae. H. A garden hybrid between *D. crenata candidissima plena* and *D. Vilmorinae.* (V. Lemoine & Son, Nancy.)

Deutzia discolor candida. (*R. H.* 1911, 118.) H. A garden hybrid between *D. scabra* and a hybrid of *D. Lemoinei.* (V. Lemoine & Son, Nancy.)

Deutzia discolor excellens. (*R. H.* 1911, 118.) H. A garden hybrid between. *D. discolor grandiflora* and *D. Vilmorinae.* (V. Lemoine & Son, Nancy.)

Deutzia longifolia. (*M. D. G.* 1911, 244.) H. One of the finest Deutzias. Leaves lanceolate, $2\frac{1}{2}$–$3\frac{3}{4}$ in. long, rather thick, whitish beneath. Flowers similar to those of *D. discolor* var. *purpurascens*, in large loose and broad panicles. Western China. (Arnold Arboretum, Boston, U.S.A.; H. A. Hesse, Weener, Hanover.)

Diacattleya Sanderae. (*G. C.* 1911, xlix. 269, 290, f. 131.) Orchidaceae. G. A garden hybrid between *Cattleya Mendelii* and *Diacrium bicornutum*. (F. Sander & Sons.)

***Dissotis plumosa.** (*G. M.* 1911, 644.) Melastomaceae. G. Shoots long and slender, densely clothed with small deep green leaves. Flowers bright magenta-rose, $1\frac{1}{2}$ in. across. West Tropical Africa. (Kew.)

Dombeya Coria. (*R. H.* 1911, 84, col. t.) Sterculiaceae. G. A tall tree. Leaves cordate or subtrilobate, 6 in. long, 5 in. broad, acuminate, unequally toothed or crenulate, glabrous above, pubescent beneath. Inflorescence an umbel-like cyme as long as the leaves. Flowers $2\frac{1}{2}$ in. across, on slender pedicels, lilac-rose. Madagascar. (Paris B. G.)

Dracaena deremensis Warneckii. (*G. C.* 1911, l. 17, f. 15; *G. M.* 1911, 516, 523, f.) Liliaceae. S. Leaves about 1 ft. long and 2 in. broad, deep green, with a narrow longitudinal band of white near the margin on both sides, paler green in the middle. Tropical Africa. (Berlin - Dahlem B. G.; J. Veitch & Sons.)

Echeveria bifurcata. (*M. G. Z.* 1911, 75, f. 9.) Crassulaceae. G. Chiefly of botanical interest. Rosettes rather lax, few-leaved. Leaves lanceolate, acuminate, greenish with a reddish tint. Flowering-stem forked, bearing 14–16 flowers which are bright reddish above and paler below. Mexico. (Darmstadt B. G.)

Echeveria montana. (*M. G. Z.* 1911, 75, f. 7.) G. Leaves hoary, broadly cuneate, rounded or truncate at the apex, apiculate, red-bordered, in dense rosettes 6-$7\frac{1}{2}$ in. across. Flowers yellow-red outside, yellow inside. Mexico. (Darmstadt B. G.)

Echinocactus Gürkeanus. (*M. K.* 1911, 132, f.) Cactaceae. G. Stem scarcely $1\frac{1}{2}$ in. high, at first simple, afterwards sparingly proliferous. Ribs 9, with chin-like glaucous tubercles. Spines 5, all radial, unequal, $2\frac{1}{2}$–6 lin. long, rough, yellowish, brownish-red at the base. Flowers yellow, up to 2 in. long and almost $1\frac{3}{4}$ in. across. Bolivia. (E. Heese, Gr.-Lichterfelde, Berlin.)

Echinocactus horizonthalonius var. **obscurispina.** (*M. K.* 1911, 181, f.) G. Differs from the type in its spines. It has 8 to 10 radial spines to each areole, the upper 6 or 7 being grey, with very dark violet tips, and the lower 3 very dark violet, with somewhat paler tips, more or less curved, the lateral ones somewhat flattened and the middle one very much flattened. Mexico. (R. Graessner, Perleberg, Germany.)

Echinocactus nidulans. (*M. K.* 1911, 119.) G. Stem simple, depressed-globose, bearing at the summit numerous stout spines $2\frac{1}{2}$ in. long and copious white woolly hairs. Ribs 20-25, broken up into thick tubercles about $\frac{3}{4}$ in. long. Spines about 15, very unequal, 5–10 lin. long. Flowers yellowish-white, $1\frac{3}{4}$ in. long, $\frac{3}{4}$ in. across. Ovary furnished with small green finely ciliate scales. Mexico. (F. De Laet, Contich, Belgium.)

Echinopsis Eyriesii var. **grandiflora.** (*M. K.* 1911, 186.) Cactaceae. G. Differs from the type in having larger dark rose-red flowers. Brazil. (R. Emskötter, Magdeburg, Germany.)

Echinopsis rhodotricha var. **argentiniensis.** (*M. K.* 1911, 188.) G. Distinguished from the type by the dull dark grey-green colour of the stem, which is elongated-globose rather than cylindric in shape. Radial spines nearly always 7. Argentina.

Epicattleya nemorale-Gigas. (*G. C.* 1911, xlix. 78.) Orchidaceae. G. A garden hybrid between *Epidendrum nemorale* and *Cattleya Warscewiczii* (*Gigas*). (Sir Trevor Lawrence.)

Epicattleya salmonicolor. (*G. C.* 1911, xlix. 308.) G. A garden hybrid between *Cattleya Mendelii* and *Epidendrum aurantiacum*. (P. Wolter, Magdeburg, Germany.)

Epidendrum Lambda. (*O. R.* 1911, 240.) Orchidaceae. G. Closely allied to *E. fragrans* and differing chiefly in the colour of the flowers. Sepals and petals light salmon colour, with greenish tips to the former. Lip cream-yellow, with violet lines; crest distinctly velvety. Colombia. (Mansell & Hatcher.)

Eremurus Olgae alba. (*G. C.* 1911, l. 57; *G. M.* 1911, 556.) Liliaceae.

H. A variety with pure white flowers. It was at first supposed to be distinct and was named *E. Setonii alba*. North Persia. (King's Acre Nurseries, Hereford.)

Eremurus Setonii alba. See **E. Olgae alba.**

Eria lanata. (*G. C.* 1911, xlix. 142.) Orchidaceae. S. A pretty species with spikes of yellowish-green flowers hairy on the outside. Sikkim Himalaya. (Mansell & Hatcher.) [In *Hook. f. Fl. Brit. Ind.* v. 801, this plant is treated as a variety of *E. flava*, Lindl., differing from the type in having smaller flowers with narrower lip, the midlobe purplish with thickened nerves on the disc.]

Eria mysorensis. (*G. C.* 1911, l. 95.) S. A small pretty species bearing white flowers with purple and yellow lip. India. (Sir Trevor Lawrence.)

Erica Williamsii. (*G. C.* 1911, l. 388.) Ericaceae. A natural hybrid between *E. Tetralix* and *E. vagans*. See *K. B.* 1911, 378. Cornwall. (P. D. Williams.)

***Euptelea Davidiana.** (*Veitch, N. H. P.* 1911, 9.) Trochodendraceae. H. A deciduous tree, 10–20 ft. high, with orbicular leaves which become brightly coloured in the autumn. Flowers insignificant. Western China. (J. Veitch & Sons.)

***Fagus japonica.** (*K. B.* 1911, 330.) Cupuliferae. H. A small deciduous tree or bush, silky hairy on the branchlets. Leaves oval, ovate or sometimes rhomboidal, 2–2½ in. long, 1–1½ in. broad, silky hairy when young, finally glabrescent. Involucre 4-lobed, covered with short stiff spines, remarkable in being much shorter than the nut. Japan. (Arnold Arboretum, Boston, U.S.A.; Kew.)

Fagus sylvatica aureo-pendula. (*M. D. G.* 1911, 423.) H. Branches pendulous. Leaves at first golden, afterwards golden-green. (J. G. van der Bom, Oudenbosch, Holland.)

***Fokienia Hodginsii.** (*G. C.* 1911, xlix. 66, 253, ff. 32–33, 111; *K. B.* 1911, 328.) Coniferae. H.? The type of a new genus which is closely allied to *Libocedrus* and *Cupressus*. Tree attaining 40 ft. in height, glabrous. Foliage in flattened "branchlet-systems," each leaf-bearing branch tripinnately divided, the pinnae arranged in one plane. Leaves in 4 ranks, resembling those of *Libocedrus macrolepis* in general appearance. Cones similar in shape to those of *Cupressus Lawsoniana*, but larger. Seeds very unequally and laterally 2-winged. Fokien, China. (H. Clinton-Baker.) [Syn. *Cupressus Hodginsii*, Dunn.]

***Fraxinus bracteata.** (*Veitch, N. H. P.* 1911, 4.) Oleaceae. H. A deciduous tree 40 ft. high, of neat habit, with light elegant pinnate leaves, which are deep glossy green above and bright green beneath. Central China. (J. Veitch & Sons.)

***Fraxinus Dippeliana.** (*Späth Cat.* 1911–12, n. 148, 97.) H. A form of *F. Bungeana* with small leaves. (L. Späth, Berlin.)

***Fraxinus Spaethiana.** (*Späth Cat.* 1911–12, n. 148, 98.) H. A new name for the plant long known in cultivation as *F. Sieboldiana*. It is easily recognised by the thick dark red-brown pulvinus at the base of the petiole. See *Engler, Bot. Jakrb.* xl. 215. Country not known; possibly Japan.

Freesia hybrida Ragionieri. (*G. C.* 1911, xlix. 233.) Iridaceae. G. Obtained by crossing *F. refracta* and *F. Leichtlinii*, and their hybrids and varieties, with *F. Armstrongii*. (Bruggemann, Villefranche-sur-Mer, France.)

Freesia Maidenii. (*G. C.* 1911, l. 62.) G. A garden hybrid between *F. refracta alba* and *F. Armstrongii*. (G. W. Kershaw, *Wahroonga, New South Wales.*)

***Fritillaria conica.** (*Jard.* 1911, 365.) Liliaceae. H. Leaves in a rosette. Flowers campanulate, pale yellow outside, bright yellow inside. Greece. (M. Herb, Naples.)

***Fritillaria Zahni.** (*Jard.* 1911, 365.) H. Flowers campanulate, rather large, brown tessellated with green inside, streaked with yellow outside. Greece. (M. Herb, Naples.)

Ginkgo biloba var. **latifolia.** (*R. H.* 1911, 83, f. 24.) Coniferae. H. A variety distinguished by its large broad leaves, only slightly lobed in the middle, somewhat undulate on the margin. (Park near Metz, Germany.)

Ginkgo biloba var. **longifolia.** (*R. H.* 1911, 82, f. 23.) H. Leaves large and more elongated than those of the typical form, more deeply lobed in the middle, and more or less laciniate. (Paris B. G.)

Gongora Tracyana. (*G. C.* 1911, xlix. 316; *O. R.* 1911, 150, 285; *K. B.* 1912, 133.) Orchidaceae. S. A new species differing from *G. Scaphephorus* in having flowers only half the size and aristate lateral lobes to the lip. Sepals and petals greenish-yellow, barred and blotched with brown, the former about ½ in. long, the latter very small. Lip ivory white, with a few brown lines on the basal half, about ⅓ in. long. Peru. (Tracy's Nursery; J. S. Bergheim.)

Grevillea robusta compacta. (*G. C.* 1911, xlix. 376, f. 171; *G. M.* 1911, 452, f.) Proteaceae. G. Differs from the type by its denser growth and more handsome foliage. (R. B. Leech.)

***Haberlea Ferdinandi-Coburgii.** (*G. C.* 1911, xlix. 338; *G. M.* 1911, 414.) Gesneraceae. H. Very similar to *H. rhodopensis* in habit of growth. Flowers tubular, violet-rose outside, lavender at the mouth, white in the throat. Bulgaria. (G. Reuthe.)

Helianthus cucumerifolius purpureus. (*G. C.* 1911, xlix. 201.) Compositae. H. Described as a new race of hybrid sunflowers, with ray-florets varying in colour from light pink to deep purple, straight and flat or twisted and pointed. (M. Herb, Naples.)

Hibiscus furcatus var. **microcarpus.** (*B. P.* vii. 103; *Fedde, Repert.* ix. 253.) Malvaceae. S. Differs from the type in its shorter peduncles, smaller yellowish corolla, much shorter calyx, and included capsule. Italian Somaliland. (Palermo B. G.)

Houlletia Wallisii. (*G. C.* 1911, l. 177, f. 84; *G. M.* 1911, 660, f.; *O. R.* 1911, 271.) Orchidaceae. S. Resembles *H. Brocklehurstiana* in habit. Inflorescence short and decumbent. Flowers large, wax-like, pale yellow with purple marks on the inside. Colombia. A re-introduction; it was in cultivation in 1869. See *G. C.* 1869, 611. (Charlesworth & Co.)

Hydrangea Davidii. (*M. D. G.* 1911, 245.) Saxifragaceae. H. Shrub, 3–6½ ft. high. Leaves long-stalked, oblong, 4–6 in. long, long-acuminate, almost glabrous. Heads of flowers terminal, flat, 6–8 in. across, with blue fertile flowers in the middle, surrounded by white sterile ones 1¾ in. across. Western China. (Arnold Arboretum, Boston, U.S.A.; H. A. Hesse, Weener, Hanover.)

***Impatiens Herzogii.** (*B. M.* t. 8396.) Geraniaceae. S. Very similar to *I. Hawkeri*, but easily distinguished through being quite glabrous, and in having vermilion-coloured instead of dark red flowers. These are 1½–2¼ in. across. New Guinea. (Glasnevin B.G.; Kew.)

***Impatiens kewensis.** (*G. C.* 1911, l. 41.) G. A garden hybrid between *I. platypetala* and *I. Herzogii*. (Kew.)

Incarvillea lutea. (*G. C.* 1911, l. 130, suppl. ill.) Bignoniaceae. H.? Herb 2–4 ft. high. Leaves mostly radical, pinnate, 8–15 in. long, long-petiolate; leaflets broadly lanceolate, crenate. Scapes stout and rigid, with a few leafy bracts. Flowers 6–20, in a loose spike, slightly pendulous on short stout pedicels. Corolla-tube 2–3 in. long, deep yellow; limb 2 in. across, pale yellow. South-west China. (Bees, Ltd.)

Ipomoea Macalusoi. (*B. T. O.* 1911, 289.) Convolvulaceae. S. Stem woody, slightly pubescent. Leaves ovate-orbicular, shortly acute and mucronate, deeply cordate at the base; petiole long, somewhat villous. Flowers axillary, in subsessile cymes. Corolla large, campanulate, orange-coloured, margined with red. Italian Somaliland. (Palermo B. G.)

***Iris chrysographes.** (*G. C.* 1911, xlix. 362.) Iridaceae. H. A new species belonging to the same group as *I. sibirica*. Rhizome slender. Stem 15–18 in. long, simple, with 1 or 2 reduced leaves. Leaves linear, 15–18 in. long, ½ in. broad. Spathes 1–2-flowered; valves green, 2–3 in. long. Flowers very rich dark red-purple with golden lines, very velvety; outer segments very large, 3 in. long, with an obovate blade; inner narrowly oblanceolate. Western China. (Miss Willmott; W. R. Dykes.)

***Iris sulphurea.** (*G. C.* 1911, l. 352.) H. This differs from *I. flavescens*, to which it has been referred, in habit, and its spathes instead of being wholly scarious are entirely green, inflated, and of a curious membranous texture. Leaves bright yellowish-green, with a glaucous bloom, the new ones very obtuse and with a conspicuous white edge. Stem rather more than 18 in. high. Flowers sulphur-yellow, the bases of the segments veined with greenish-brown and the beard bright orange-yellow. Caucasus. (W. R. Dykes.)

Iris tingitana gigantea. (*R. H.* 1911, 166.) H. H. A robust variety with very large flowers, the outer segments suffused and veined with

pale blue, and the inner deep violet-blue; claws bright yellow. (Rivoire & Son, Lyons.)

Iris Vartani alba. (*G. C.* 1911, l. 448.) H. Flowers pure white except for the pale greenish-yellow central ridge of the claw of the falls and a few faint veins of the same colour. (W. R. Dykes.)

Juniperus Pinchoti. (*J. of H.* 1911, lxii. 289.) Coniferae. H. Compact in habit, growing to 30 ft. high, the foliage in one form being green and in another glaucous. Berries pink. North-western Texas. (J. W. Riggs, Waterloo, Kansas, U.S.A.)

***Kennedya Beckxiana.** (*B. M.* t. 8358.) Leguminosae. G. A handsome species differing from *K. rubicunda* in always having 2-flowered peduncles and a glabrous pistil. A climbing perennial herb. Leaves pinnately 3-foliolate; leaflets obovate to elliptic, up to 3 in. long and 2 in. broad. Flowers about 1½ in. long, red except for a greenish-yellow dark-margined blotch at the base of the standard. South-western Australia. (Kew.)

Laelia Canari. (*R. H.* 1911, 483.) Orchidaceae. G. A garden hybrid between *L. Digbyana* and *L. xanthina*. (C. Béranek, Paris.)

Laelia Chatini. (*O. R.* 1911, 29.) G. A garden hybrid between *L. Jongheana* and *L. harpophylla*. (J. Ginot, St. Étienne, France.)

Laelia tenejalis. (*G. C.* 1911, l. 247.) G. A garden hybrid between *L. grandis tenebrosa* and *L. majalis*. (Dr. Hodgkinson.)

Laelio-cattleya callistor. (*O. W.* ii. 14.) Orchidaceae. G. A garden hybrid between *Cattleya bicolor* and *L.-c. callistoglossa*. (F. Sander & Sons.)

Laelio-cattleya Cowanii. (*G. C.* 1911, xlix. 376; *O. W.* i. 223.) G. A garden hybrid between *Laelia cinnabrosa* and *Cattleya Mossiae*. (Liverpool Orchid Nursery Co.)

Laelio-cattleya Davidsoniae. (*G. C.* 1911, l. 282.) G. A garden hybrid between *L.-c. bella* and *Cattleya labiata*. (E. H. Davidson.)

Laelio-cattleya Denganii. (*G. C.* 1911, l. 381; *G. M.* 1911, 900.) G. A garden hybrid between *L.-c. Cappei* and *Cattleya Dowiana*. (F. Wellesley.)

Laelio-cattleya Desgrangeana. (*O. R.* 1911, 45.) G. A garden hybrid between *Cattleya labiata* and *Laelia lobata*. (J. Ginot, St. Étienne, France.)

Laelio-cattleya Duchesniae. (*T. H.* 1911, 506.) G. A garden hybrid between *Laelia callistoglossa* and *Cattleya speciosissima*. (F. Lambeau, Brussels.)

Laelio-cattleya Farrantiae. (*G. C.* 1911, xlix. 376.) G. A garden hybrid between *Laelia purpurata* and *L.-c.* Pallas. (F. Wellesley.)

Laelio-cattleya fascinator-Mossiae. (*G. C.* 1911, xlix. 376, 422, f. 191; *O. W.* i. 223.) G. A garden hybrid. (Sir Trevor Lawrence.)

Laelio-cattleya Floryi. (*G. C.* 1911, l. 462.) G. A garden hybrid between *L.-c.* "*Violetta*" and *Cattleya Trianae*. (Tracy's Nursery.)

Laelio-cattleya Harrisoniae. (*O. R.* 1911, 348.) G. A garden hybrid between *Laelia xanthina* and *Cattleya Loddigesii*. (C. Alwyn Harrison.)

Laelio-cattleya Herscentiae. (*G. C.* 1911, l. 312.) G. A garden hybrid between *Laelia Boothiana* and *Cattleya aurea*. (Stuart Low & Co.)

Laelio-cattleya Lambeauae. (*T. H.* 1911, 457.) G. A garden hybrid between *Laelia praestans* and *Cattleya Hardyana*. (F. Lambeau, Brussels.)

Laelio-cattleya Morningtoniae. (*G. C.* 1911, xlix. 333; *G. M.* 1911, 411, 413, f.) G. A garden hybrid between *L.-c. Pallas* and *L.-c. fascinator*. (F. Wellesley.)

Laelio-cattleya Muelleri. (*O. R.* 1911, 255.) G. A garden hybrid between *L. purpurata* and *L.-c. Canhamiana*. (C. F. Karthaus, Potsdam, Berlin.)

Laelio-cattleya Rothschildiana. (*J. H. F.* 1911, 258.) G. A garden hybrid between *L.-c. Martinetii* and *Cattleya Mossiae*. (C. Schwarz, Ferrières-en-Brie, France.)

Laelio-cattleya Steppestediana. (*O. W.* ii. 63.) G. A garden hybrid between *Cattleya Luddemanniana* and *L.-c. Andromeda*. (Cte. J. de Hemptinne, St. Denis, Ghent.)

Laelio-cattleya teignmouthiensis. (*G. C.* 1911, xlix. 18.) G. A garden hybrid between *L.-c. amanda* and *Cattleya labiata*. (E. F. Clark.)

Laelio-cattleya Vilmoriniana. *See* **Brasso-cattleya Vilmoriniana.**

***Landolphia Petersiana.** (*B. M.* t. 8389.) Apocynaceae. S. A climbing shrub. Leaves elliptic or oblong-elliptic, 3–4½ in. long, 1¼–2 in. broad, leathery, finally glabrous. Panicle pedunculate, bearing numerous sessile flowers in clusters at the tips of its branchlets. Corolla white, fragrant; tube slender, ¼–⅓ in. long; limb 5-lobed; lobes oblong or linear-oblong, ⅓–⅔ in. long. East Africa. (Kew.)

Leonotis dysophylla. (*B. M.* t. 8404.) Labiatae. Differs from *L. Leonurus* in having broader leaves, longer calyx-teeth, and orange-yellow rather than scarlet flowers. South Africa. (Cambridge B. G.)

Ligustrum ovalifolium multiflorum. (*G. C.* 1911, l. 237, f. 109.) Oleaceae. H. A very free-flowering variety. (E. A. Bowles.)

***Liquidambar formosana.** (*Veitch, N. H. P.* 1911, 9.) Hamamelidaceae. H. A deciduous tree with handsome deep green 3-lobed leaves. It is the Feng Tree of the Chinese, who use its wood for making tea chests. China; Japan; Formosa. (J. Veitch & Sons.)

Livistona Dournowiana. (*R. H. B.* 1911, 128.) Palmae. S. A new palm with leaves resembling those of *Latania borbonica*. Country not stated. (J. De Cock.)

***Lonicera Henryi.** (*B. M.* t. 8375.) Caprifoliaceae. H. Closely allied to *L. Giraldii*, but easily distinguished by the leaves being quite glabrous except on the margin and midrib. Climbing shrub. Leaves oblong-lanceolate, 1¾–2¾ in. long, ½–¾ in. broad. Peduncles 2-flowered, ¼–½ in. long, in the axils of the uppermost leaves. Corolla 2-lipped, cream-yellow, pink and orange-yellow; tube about ⅓ in. long, glabrous outside; upper lip 4-lobed; lower lip undivided, oblong, ⅔ in. long. Central and Western China. (Right Hon. L. Harcourt, &c.)

***Lonicera nitida.** (*G. C.* 1911, l. 102, 312; *G. M.* 1912, 819.) H. Evergreen shrub, 3–6 ft. high, with a very neat habit; branches erect, densely leafy. Leaves leathery, ovate, ¼–⅜ in. long, obtuse, subcordate at the base, shining and dark green above, very pale beneath. Flowers in pairs, small, cream-white, fragrant. Fruits globose, blue-purple, the size of a large pea. West China. (Arnold Arboretum, Boston, Mass., U.S.A.; J. Veitch & Sons.) [Syn. *L. pileata*, Oliv. var. *yunnanensis*, Rehder.]

Mammillaria Sartorii. (*M. K.* 1911, 50, f.) Cactaceae. G. Globose or cylindric-globose, very proliferous, woolly at the summit, 3⅓–5 in. across. Tubercles about ½ in. long, pyramidal, irregularly many-angled. Areoles circular, densely white-woolly. Spines 4–6, 2½–4 lin. long. Flowers about ¾ in. long, yellowish-carmine. Two forms are recognised: *f. brevispina*, with the spines only ½–1 lin. long, and *f. longispina*, with central spines 4 lin. long. Mexico. (Darmstadt B. G.; R. Graessner, Perleberg, Germany.)

Mammillaria Seideliana. (*M. K.* 1911, 154, f.) G. Stem globose or shortly cylindric, about 3 in. high, at first simple, afterwards proliferous. Tubercles cylindric to conical, about 5 lin. long. Spines 2½–7½ lin. long, white, yellow, or brown; radial about 20; central 3, longer than the radial, 1 hooked. Flowers yellowish, up to ¾ in. long, ⅔ in. across. Mexico. (R. Seidel, Magdeburg.)

Maxillaria abbreviata. (*Orchis*, 1911, 105, f. 13.) Orchidaceae. S. A very free-flowering species. Leaf-blade oblong, 10 in. long, 3¾ in. broad, darker green above, pale on the margin, and with a pale transparent midrib; petiole 7 in. long. Flowers 3 in. long, 3¾ in. broad, copper-coloured, somewhat pale on the lip and column. Country not stated. (Heidelberg B. G.)

Meconopsis integrifolia × grandis. (*G. C.* 1911, l. 22, f. 14.) Papaveraceae. H. A garden hybrid. (R. H. Beamish.)

Melianthus intermedius. (*G. C.* 1911, l. 41.) Sapindaceae. G. A garden hydrid between *M. comosus* and *M. major*. (La Mortola, Ventimiglia, Italy.)

***Meliosma cuneifolia.** (*B. M.* t. 8357.) Sabiaceae. H. Tree or shrub. Leaves narrowly obovate-cuneate, 2½–7 in. long, ½–3 in. broad, serrate, glabrous except on the nerves and in the nerve angles beneath. Panicle pyramidal, many-flowered, about 8 in. across. Flowers greenish-yellow, ¼ in. across. Sepals 5, ovate or rounded ovate. Petals 5, very unequal, the 3 outer obicular, the 2 inner smaller and deeply 2-lobed. Stamens 5. Fruit

subglobose, entire or 2-lobed, 2–3 lin. across. Western China. (J. Veitch & Sons.)

***Mesembryanthemum dealbatum.** (*K. B.* 1911, 357.) Ficoideae. G. Differs from *M. obtusum* in having equal thicker and whitish leaves, shortly pedunculate flowers, and a 5-lobed calyx. Petals in 2 or 3 rows, linear, ½–⅔ in. long, pale rose. Little Namaqualand. (Kew.)

***Mesembryanthemum oculatum.** (*K. B.* 1911, 313.) G. A new species allied to *M. viridiflorum*, differing in the much shorter branches, more crowded leaves, and in having white flowers with a red centre. Leaves ¼–1¼ in. long, 2–3 lin. broad at the base, narrowed to an obtuse apex. Petals in many loose rows, the outer 5 lin. long, linear. South Africa. (Kew.)

***Mesembryanthemum rubrolineatum.** (*K. B.* 1911, 82.) G. A new species near *M. aloides*, but easily distinguished by its larger leaves and flowers, and by the yellow petals having in the middle on both sides a red line. Leaves crowded in a rosette, trigonous-oblong, 1–2 in. long. Flowers solitary or in pairs, 1¾ in. across. Petals numerous, in 2 rows. South Africa. (Kew.)

Miltonia Berti. (*R. H.* 1911, 264; *J. H. F.* 1911, 220.) Orchidaceae. S. A garden hybrid between *M. Bleuana* and *M. rexillaria*. (E. Bert, Bois Colombes, Seine, France.)

Miltonia candida superba. (*G. C.* 1911, l. 282.) S. Flowers very fine. Lip white, with a purple blotch. (Mansell & Hatcher.)

Miltonia Warscewiczii picta. (*G. C.* 1911, xlix. 78; *G. M.* 1911, 106.) S. A fine form with well-rounded flowers. Sepals and petals light brown tipped with yellow. Lip broadly ovate, dark rose, with a pure white front. (Charlesworth & Co.)

Montanoa Wercklei. (*G. C.* 1911, l. 122.) Compositae. G. A new species allied to *M. grandiflora*. Shrub attaining a height of about 20 ft., with white-tomentose branches. Leaves 5–7 lobed or unequally pinnate or trifoliate, 8–10 in. long and broad, more or less cordate at the base, softly pubescent; leaflets not more than 1½ in. long, usually much smaller; petioles 6–7 in. long. Flower-heads white (?), about 2 in. across, arranged in broad corymbs. Costa Rica. (La Mortola, Ventimiglia, Italy.)

Narcissus cyclamineus × minimus. (*G. C.* 1911, xlix. 158.) Amaryllidaceae. H. A garden hybrid. (E. A. Bowles.)

Nephrolepis Batchelori. (*G. C.* 1911, xlix. 255.) Filices. S. "A new sport." No description. (E. J. Batchelor & Sons.)

Nephrolepis Marshallii compacta. (*G. C.* 1911, xlix. 236; *G. M.* 1911, 301.) S. A sport from *N. exaltata* var. *Marshalli*, with very finely divided fronds which resemble a layer of moss. (H. B. May & Sons.)

Nerine Veitchii. (*G. C.* 1911, l. 244; *Gard.* 1911, 486, f.) Amaryllidaceae. G. Supposed to be a new species resembling a pale form of *N. Bowdenii*. Flowers 2¼ in. across, with recurved segments. South Africa. (R. Veitch & Son.) [= *N. Bowdenii pallida*.]

Nervilia Fuerstenbergiana. (*Fedde. Repert.* ix. 330.) Orchidaceae. S. Plant up to 4 in. high, with globose 1-leaved tubers. Leaves petiolate, reniform, obscurely 7-angled, about 1¾ long and 2½ in. broad. Scape erect, 1¾–2 in. long, 1-flowered. Flower about ⅔ in. long. Sepals and petals greenish-grey, with fine reddish lines. Lip white, with red dots and blotches. Cameroons. (Baron M. v. Fürstenberg, Hugenpoet, Mintard, Germany.)

Nymphaea Listeri. (*G. C.* 1911, l. 244; *G. M.* 1911, 777, f.) Nymphaeaceae. S. Allied to *N. zanzibariensis*. Flowers deep bright blue with darker blue stamens. A tropical species, but country not stated. (Earl of Warwick.)

Nymphaea Maynardii. (*G. C.* 1911, l. 244.) S.? "A magnificent and fragrant flower, fully 9 inches across, and of a lovely pale shade of heliotrope." (Earl of Warwick.)

Nymphaea pennsylvanica. (*G. C.* 1911, l. 244.) S. "A pale blue variety." (Earl of Warwick.) [*N. pennsylvania*, Conard, is a garden hybrid between *N. caerulea* and *N. zanzibariensis*, raised in the Botanic Garden of the University of Pennsylvania, where it first flowered in 1901.]

Nymphaea stellata rosea. (*G. C.* 1911, l. 244.) S. Flowers clear pink, with a golden centre. (L. de Rothschild.)

Odontioda Boltonii. (*G. C.* 1911, xlix. 206; *O. R.* 1911, 154, f. 19.) Orchidaceae. G. A garden hybrid

between *O. Vuylstekeae* and *Cochlioda Noetzliana*. (W. Bolton.)

Odontioda Floryi. (*G. C.* 1911, xlix. 141.) G. A garden hybrid between *Cochlioda Noetzliana* and *Odontoglossum Andersonianum*. (H. S. Goodson.)

Odontioda grata. (*O. W.* i. 83; *O. R.* 1911, 310.) G. A garden hybrid between *Cochlioda Noetzliana* and *Odontoglossum tripudians*. (F. Sander & Sons.)

Odontioda Jessopiae. (*G. C.* 1911, xlix. 255.) G. A garden bybrid between *Odontoglossum* "Queen Alexandra" and *Cochlioda Noetzliana*. (Mansell & Hatcher.)

Odontioda rosefieldiensis. (*G. C.* 1911, xlix. 301, 308, f. 140; *G. M.* 1911, 379.) G. A garden hybrid betweeen *Cochlioda Noetzliana* and *Odontoglossum triumphans*. (de B. Crawshay.)

Odontocidium Fowlerianum. (*G. C.* 1911, l. 343; *G. M.* 1911, 878 f.; *O. R.* 1911, 353.) Orchidaceae. G. A garden hybrid between *Odontoglossum cirrhosum* and *Oncidium Forbesii*. (J. G. Fowler.)

Odontoglossum ashlandense. (*O. R.* 1911, 57.) Orchidaceae. G. A garden hybrid between *O. Edwardii* and *O. Ossulstonii*. (R. Ashworth.)

Odontoglossum Ashworthianum. *G. C.* 1911, xlix. 142.) G. A garden hybrid between *O. Uroskinneri* and *O. cirrhosum*. (R. Ashworth) [The name is in use for a supposed natural hybrid between *O. Cervantesii* and *O. cordatum*.]

Odontoglossum bellum. (*G. C.* 1911, xlix. 300.) G. A garden hybrid between *O. crispum* and *O. bellatulum*. (J. S. Moss.)

Odontoglossum crispum Canoniae. (*G. C.* 1911, xlix. 14.) G. Flowers large, pure white, bearing large evenly-distributed claret-coloured blotches. (J. & A. A. McBean.)

Odontoglossum Godmanii. (*G. C.* 1911, xlix. 46; *G. M.* 1911, 75.) G. A garden hybrid between *O. Edwardii* and *O. Rolfeae*. (F. Du Cane Godman.)

Odontoglossum Halseyanum. (*G. C.* 1911, xlix. 46; *Gard.* 1911, 65, f.) G. A garden hybrid of unrecorded parentage. It resembles a finely blotched form of *O. crispum*. (J. Gurney Fowler.)

Odontoglossum Harwoodii. (*G. C.* 1911, xlix. 78, 98, f. 51; *O. R.* 1911, 81, f.) G. A garden hybrid between *O. Wiganianum* and *O. maculatum auriferum*. (Charlesworth & Co.)

Odontoglossum Manselliae. (*O. R.* 1911, 152.) G. A garden hybrid between *O. Vuylstekeae* and *O. Harryanum*. (Mansell & Hatcher.)

Odontoglossum Mariae. (*G. C.* 1911, xlix. 78; *G. M.* 1911, 106.) G. A garden hybrid between *O. Uroskinneri* and *O. Charlesworthii*. (Charlesworth & Co.)

Odontoglossum ramos-Edwardii. (*G. C.* 1911, xlix. 269.) G. A garden hybrid between *O. ramosissimum* and *O. Edwardii*. (Sir Trevor Lawrence.)

***Odontoglossum rosefieldiense.** (*G. C.* 1911, xlix. 46, 163, f. 73; *O. W.* i. 122, f.) G. A garden hybrid between *O. Harryanum* and *O. Lambeauianum*. (de B. Crawshay.)

Odontoglossum Rossianae var. flavida. (*G. C.* 1911, xlix. 269.) G. Flowers cream-yellow, spotted with chocolate-red. (H. Graire, Amiens.)

Odontoglossum swietenicolor. (*G. C.* 1911, xlix. 206, 210, f. 93; *G. M.* 1911, 260.) G. A garden hybrid between *O. Wilckeanum* and *O. Vuylstekei*. (Sir Trevor Lawrence.)

Odontoglossum Wilsoni. (*O. R.* 1911, 28.) G. A garden hybrid between *O. crispo-Harryanum* and *O. Vuylstekei*. (W. Thompson.)

***Oenothera ovata.** (*G. C.* 1911, xlix. 418, f. 190.) Onagraceae. H. Closely allied to *O. taraxacifolia*, but the leaves are almost entire, with sinuate margins, sometimes irregularly few-lobed, the habit of the plant is more compact, and the rich orange-yellow flowers are smaller (1–1½ in. across). California. (M. Prichard; Kew.)

Olearia angustifolia. (*G. C.* 1911, xlix. 52.) Compositae. H. H. A stout shrub or small tree, white-tomentose on the branches, underside of leaves, and peduncles. Leaves sessile, narrow, 3–5 in. long, pointed, stiff, spiny on the margin. Flower-heads 1¼-2 in. across; ray-florets white; disc florets purple. New Zealand. (Glasnevin B. G.)

***Olearia avicenniaefolia.** (*G. C.* 1911, xlix. 52.) H. H. A shrub or small tree. Leaves elliptic-lanceolate or oblong-lanceolate, 2–4 in. long,

quite entire, green above, clothed with a fawn-coloured tomentum beneath; petiole rather long. Flower-heads small, white, in large erect clusters. New Zealand. (Glasnevin B. G.)

*Olearia lacunosa. (*G. C.* 1911, xlix. 52.) H. H. A stout shrub or small tree. Leaves linear, 6–7 in. long, ¾ in. broad, standing out at right angles to the branches, green above, with a yellow midrib, downy beneath, with strong lateral veins. Flower-heads small, numerous, in panicles forming a corymbose mass. New Zealand. (Glasnevin B. G.)

*Olearia Lyallii. (*G. C.* 1911, xlix. 53.) H. H. A robust shrub or small tree. Leaves elliptic-ovate or orbicular-ovate, 4–6 in. long, clothed when young with white woolly hairs, glabrous when old. Flower-heads discoid, 1¼–1½ in. across, dark brown, in stout terminal racemes 4–8 in. long. New Zealand. (Capt. Dorrien-Smith; Glasnevin B. G.)

*Olearia odorata. (*G. C.* 1911, xlix. 53.) H. or H. H. Similar to *O. virgata*, but it has cylindrical branches and larger and broader leaves. New Zealand. (Sir J. Ross.)

*Olearia oleifolia. (*G. C.* 1911, xlix. 53.) H. H. Similar to *O. Haastii* in habit, flower-heads, and time of flowering. Leaves narrow, 2–3 in. long. New Zealand. (Glasnevin B. G.)

*Olearia virgata. (*G. C.* 1911, xlix. 53.) H. H. An erect much-branched shrub. Leaves linear, ¼–½ in. long, opposite or in opposite fascicles. Flower-heads small, dull-coloured. New Zealand. (Glasnevin B. G.)

Oncidium concolor var. **rhodoptera.** (*O. R.* 1911, 158.) Orchidaceae. G. Differs from the type in having the upper part of the column wings and the margin of the stigma red. (Tracy's Nursery.)

Oncidium Janssenii. (*O. R.* 1911, 310, 316.) G. A garden hybrid between *O. tigrinum* and *O. Forbesii*. (Charlesworth & Co.)

*Oncidium Mulleri. (*G. C.* 1911, xlix. 333; *G. M.* 1911, 413.) G. Allied to *O. corynephorum* or possibly a form of it. Flowers 1½ in. across, in long twining spikes. Sepals and petals white, tinged with rose. Lip ovate, rose-purple, with a cream-yellow crest. Peru. (F. Sander & Sons.)

*Oncoba Routledgei. (*G. C.* 1911, xlix. 322, ff. 145–146 & suppl. ill.; *K. B.* 1911, 262.) Bixaceae. S. Shrub, up to 20 ft. high, bearing strong spines 1 in. long or less. Leaves alternate, shortly stalked, elliptic-oblong or oblong, 2½–4½ in. long, 1¼–2¼ in. broad, coarsely crenate-serrate, almost glabrous. Flowers borne singly or two together on the old wood, white, fragrant, 2–2¼ in. across. Petals about 8. Stamens very numerous. Uganda. (C. E. Shea.) [Syn. *O. spinosa* var. *Routledgei*; G. C. 1911, xlix. 236, 285; G. M. 1911, 277, 301, f. (as *O. speciosa* var. *Routledgei*.)]

Opuntia Deamii. (*M. K.* 1911, 4.) Cactaceae. G. About 3 ft. high. Branches few, ascending; joints erect or spreading, obovate to oblanceolate, 10–12 in. long. Spines 2–6, 1¼–2¼ in. long, stout, white or dull yellow. Flowers 3 in. long, salmon-rose to terra-cotta-coloured. See *Contr. U. S. Nat. Herb.* xiii. 309, t. 65. Guatemala. (Haage & Schmidt, Erfurt.)

Osbeckia Hildebrandii. (*K. B.* 1911, 269.) Melastomaceae. S. Leaves ovate or oblong, 4–8 in. long, 1½–3 in. broad, hairy above and on the principal veins beneath, 7-nerved; petiole 5–8 lin. long. Flowers in a densely hairy-tomentose raceme which is finally elongated. Petals rose-coloured, obovate-orbicular, ¾–1 in. long. Burma. (Kew.)

Osmanthus armatus. (*G. C.* 1911, l. 113, f. 54.) Oleaceae. H. An evergreen shrub or small tree. Leaves oblong-lanceolate, 3–6 in. long or more, ¾–1½ in. broad, coarsely toothed; teeth triangular, with very slender spiny tips; upper leaves smaller and less prickly; petiole ⅛–¼ in. long. Flowers cream-white, fragrant, ¼ in. across, in axillary fascicles produced in autumn. Central China. (J. Veitch & Sons.)

Paphiopedilum Sladdenii. (*O. R.* 1911, 41, f. 4.) Orchidaceae. S. A garden hybrid between *P. glaucophyllum* and *P. bellatulum*. (C. Sladden, Liége.) [Syn. *Cypripedium Sladdenii*; T. H. 1911, 170.]

Paulownia Silvestrii. (*M. D. G.* 1911, 242.) Scrophulariaceae. H. A small tree, with densely brown-woolly foliage, and with all parts of the inflorescence furnished with dark bronze-coloured hairs. Leaves narrower than is usual in the genus, deeply cordate, irregularly lobed, coarsely and bluntly toothed. Flowers sky-blue. Central China. (C. Sprenger, Naples.)

***Pentstemon arizonicus.** (*M. G. Z.* 1911, 301, f.) Scrophulariaceae. H. A densely tufted plant, with glandular-hairy stems about 10 in. high. Radical leaves long-petiolate, elliptic, finely crenate; cauline leaves sessile. Flowers glandular-hairy, pale reddish-violet, paler on the underside, bearded and white-striped an the lower lip inside. Arizona. (Darmstadt B. G.)

Philadelphus brachybotrys var. purpurascens. (*M. D. G.* 1911, 245.) Saxifragaceae. H. Distinguished by its purple pedicels and calyx. Western China. (Arnold Arboretum, Boston, U.S.A.; H. A. Hesse, Weener, Hanover.)

Philadelphus Schrenckii var. Jackii. (*Fedde, Repert.* x. 127.) H. Distinguished from the type by the leaves on the underside and the ovary at the base being more hairy. Corea; Northern China. (Arnold Arboretum, Boston, U.S.A.)

***Phyllodoce amabilis.** (*B. M.* t. 8405.) Ericaceae. H. A new species allied to *P. empetriformis* and *P. intermedia*, but differing from both in the campanulate, not urn-shaped, almost wholly white corolla, and in having the filaments more than twice as long as the small anthers. North America. (Kew.)

Picea alba × sitkaensis. (*M. D. G.* 1911, 323.) Coniferae. H. (Herr von Grass, Klanin, Germany.)

Picea orientalis atrovirens. (*M. D. G.* 1911, 172.) H. Distinguished by its dark green leaves. (H. den Ouden & Son, Boskoop, Holland.)

***Pinguicula Rosei.** (*G. C.* 1911, xlix. 82, 292, f. 42.) Lentibulariaceae. G. This differs from *P. caudata* in the shape of its leaves and in the colour of its flowers, which are deep violet-purple or almost blue, and are about 1¼ in. across. Mexico. (Kew.)

Pinus Cembra columnaris. (*T. H.* 1911, 474.) Coniferae. H. A form with erect branches. (H. Hellemann, Moorende, Bremen.)

Pinus edulis albo-variegata. (*M. D. G.* 1911, 423.) H. A form in which white leaves are mixed with the green ones. (F. Graf von Schwerin, Wendisch-Wilmersdorf, Germany.)

***Polianthes Blissii.** (*J. R. H. S.* xxxvi. 605, f. 179.) Amaryllidaceae. G. A garden hybrid between *Bravoa geminiflora* and a garden form of *Polianthes tuberosa*. (Bliss, Orpington.)

Polypodium Mandaianum. (*J. of H.* 1911, lxiii. 299.) Filices. G. A crested form of *P. aureum*. (W. A. Manda, South Orange, N.J., U.S.A.)

Populus Silvestrii. (*M. D. G.* 1911, 243.) Salicaceae. H. Nearly allied to *P. lasiocarpa*. Leaves long-stalked, broadly ovate, long-acuminate, serrate. Central China. (C. Sprenger, Naples.)

***Potentilla Veitchii.** (*G. C.* 1911, l. 102; *Veitch, N. H. P.* 1911, 4, f.) Rosaceae. H. A new species with a general resembance to *P. fruticosa*, but easily distinguished by its pure white flowers. An evergreen shrub, 3–5 ft. high. Leaves pinnate, ¾–1 in. long, including petiole; leaflets 3–5, sessile, oval, ⅜ in. long, silky hairy on both sides. Flowers usually solitary, ¾–1¼ in. across. Central China. (J. Veitch & Sons.)

***Primula Beesiana.** (*G. C.* 1911, l. 242, f. 110 & suppl. ill.) Primulaceae. H. Very similar to *P. Bulleyana*, but differing in having deep rose-carmine flowers with a bright orange eye. Leaves ovate-lanceolate, 5–9 in. long, 3–6 in. broad, irregularly toothed; midrib dull red. Scapes stout, 2–3 ft. high, densely covered on the upper part with a white meal. Flowers in 5–8 superposed whorls, 12–15 in each whorl, slightly fragrant. Calyx campanulate, 2½–5 lin. long. Corolla-limb about ⅝ in. across. South-west. China. (Bees, Ltd.)

***Primula Gagnepainii.** (*G. C.* 1911, l. 102, f. 47.) H.? Similar to *P. Veitchii* and *P. lichiangensis*, but it has more orbicular leaves, thinner in texture, with 7 coarsely toothed lobes, the primary lobes being again lobed. Leaf-blade about 3 in. across; petiole about 3 in. long, hairy. Scape 6 in. long. Flowers in an umbel, violet-purple. Calyx gradually tapering to the base or sometimes bulb-like. West China. (Miss Willmott.)

***Primula Lindsayi.** (*G. M.* 1911, 683.) H. A garden hybrid of which the parentage is not recorded. It has deep crimson flowers with a purplish-yellow eye. (R. Lindsay.)

Primula Maximowiczii. (*B. M.* t. 8363.) H. Nearest allied to *P. tangutica*, but distinguishable by its shorter calyx-lobes and red corolla with shorter lobes. Leaves all radical, narrowly elliptic or oblong-elliptic, 1¾–6 in. long, ¾–2 in. broad, toothed. Scape stout, 8–12 in. high, bearing 1

whorl or several whorls of flowers. Corolla-tube ½-⅔ in. long; limb ⅔ in. across, with oblong reflexed lobes. Northern China. (J. Veitch & Sons.)

Primula Watsoni. (*N. B. G. Edinb.* v. 63, t. 61.) H. A new species belonging to the same group as *P. bellidifolia*. Leaves sessile, in a rosette, oblanceolate, 3–6 in. long, obtuse, long-attenuated at the base, lobulate-crenate except at the base. Scape straight, 4–12 in. high, farinose at the apex. Flowers sessile, ⅓–½ in. long, in a globose head or ovate farinose spike. Corolla dark purple; tube cylindric, 3½–5 lin. long; limb cupshaped, 1½–2 lin. across. Western China. (Edinburgh B.G.)

***Primula Winteri.** (*G. C.* 1911, xlix. 130, f. 63; *Gard.* 1911, 129, fig.) H. A variety of *P. petiolaris*, possibly var. *pulverulenta*. It has the habit of the common Primrose, with obovate-spathulate leaves 4 in. long, 2 in. broad, irregularly toothed, covered with a whitish meal. Flowers 20 or more together in a crowded umbel. Scape short. Corolla pale purple, with a broad white ring surrounding a yellow eye; tube 1 in. long; limb flat, 1¼ in. across; lobes broad, rounded, toothed. Himalaya. (R. Gill & Son.)

***Prostanthera pulchella.** (*B. M.* t. 8379.) Labiatae. A distinct new species resembling *P. linearis* in habit. An undershrub about 1½ ft. high, slender, free-flowering. Leaves subsessile, linear or linear-lanceolate, ⅓–¾ in. long, 1 lin. broad. Flowers in loose rather stiff racemes 2-3 in. long. Corolla subrotate, faintly 2-lipped, lilac, the tube white at the base, dotted with dark purple at the throat; limb 8 lin. across, 5-lobed. Australia. (T. A. Dorrien Smith; Kew.)

Prunus lusitanica aureo-variegata. (*M. D. G.* 1911, 423.) Rosaceae. H. Leaves with yellow-variegated leaves. (J. Valckenier-Suringar, Wageningen, Holland.)

***Prunus microcarpa.** (*B. M.* t. 8360; *K. B.* 1911, 205.) H. Shrub, often dwarf, with twiggy or spreading, rigid or tortuous branches. Leaves broadly ovate to lanceolate-oblong, ⅓–1¼ in. long, ¼–¾ in. broad, subacute, serrate. Flowers very few, often only 2, on short leafy twigs. Sepals ovate, ciliate. Petals pale rose or white, obovate, about 2½ lin. long. Fruit ovoid, rather pointed, 3–5 lin. long, red or yellow when ripe. Persia, &c. (Kew.)

***Prunus rufa.** (*K. B.* 1911, 331.) H. A deciduous tree, 15–20 ft. high; young branchlets covered with a dense rust-coloured pubescence. Leaves narrowly elliptic or oblong-lanceolate, 2–4 in. long. acuminate, conspicuously glandular-dentate. Flowers pink, ½ in. across, produced singly or in pairs on the previous year's growth. Nepal and Sikkim. (Kew.)

***Prunus serrulata *f.* Veitchiana.** (*Fedde, Repert.* ix 122.) H. This is the plant known in gardens as *P. Pseudocerasus* "James H. Veitch." It differs from typical *P. serrulata* in having very sharply serrate sepals with about 5 to 9 narrow teeth each side, 26–36 purple-rose petals, and markedly mucronate anthers. (J. Veitch & Sons.)

***Pseuderanthemum malaccense.** (*B. M.* t. 8368; *K. B.* 1911, 79.) Acanthaceae. S. Shrub, 3–5 ft. high. Leaves lanceolate to elliptic-lanceolate, 3–5 in. long, ¾–2 in. broad; petiole ⅓–¾ in. long. Inflorescence ½–2 in. long, with numerous flowers, many opening together in whorls, finally raceme-like. Corolla salver-shaped; tube narrow, nearly straight, 1–1½ in. long, pale violet; limb 2-lipped, about ¾ in. across, pale violet or violet-white, with red specks on the mid-lobe of the lower lip. Syn. *Eranthemum malaccense*, C. B. Clarke. Malay Peninsula. (Kew.)

Pteris Degoesi. (*T. H.* 1910, 9; 1911, 35, f.) Filices. G. A garden hybrid between *P. Drapsi* and *P. argyrea*. (De Goes, Jette-St. Pierre, Belgium.)

Pteris De Smedti. (*T. H.* 1911, 499, 502, f.) G. Apparently a form of *P. cretica* with crested fronds. (De Smedt, Neder-over-Heembeek, Belgium.)

Pyronia. (*G. C.* 1911, xlix. 221, 285.) Rosaceae. H. [*Pyronia* "John Seden" or *P. Sedenii* is the name given to a hybrid between the Bergamotte Esperen Pear and the Portugal Quince.] (J. Veitch & Sons.)

Pyrus hupehensis. (*M. D. G.* 1911, 242.) Rosaceae. H. A tree with a straight slender trunk. Branchlets sometimes ending in a thorn. Leaves long-stalked, more or less ovate, rounded or cuneate at the base, long-acuminate, sharply toothed, fresh green above, cream-coloured beneath. Flowers in dense clusters, smaller than in *P. communis*. Central China. (C. Spenger, Naples.)

Ranunculus palaestinus atrococcineus. (*Jard.* 1911, 383.) Ranunculaceae. H. Flowers large, on long

peduncles, intense scarlet-red. Palestine. (M. Herb, Naples.)

*Rhododendron ambiguum. (*B. M.* t. 8400.) Ericaceae. H. A new species belonging to the group with scaly-glandular leaves and nearest allied to *R. triflorum*. Leaves persistent, lanceolate, 1½–3 in. long including the petiole. Corymbs terminal, usually 5–7-flowered. Corolla broadly campanulate, about 2 in. across, greenish-yellow, dotted with green on the upper side within. Western China. (J. Veitch & Sons.)

*Rhododendron japonicum var. pentamerum. (*B. M.* t. 8403.) H. This plant has been known under the name of *R. Metternichii*, but it differs from the true *R. Metternichii*, Sieb. & Zucc. in having a 5-lobed corolla, 10 or 11 stamens and a 5-celled ovary. Leaves oblanceolate, about 3 in. long, ¾–1¼ in. broad, rusty-tomentose beneath. Flowers in a rather loose rounded head. Corolla rose-coloured, almost campanulate, about 3½ in. across. Japan. (Kew.)

*Rhododendron Loderi. (*G. C.* 1911, i. 31, suppl. ill.) H. A garden hybrid between *R. Griffithianum* and *R. Fortunei*. (Sir E. G. Loder.)

Rhododendron rufescens. (*G. C.* 1911, xlix. 317.) H. A dwarf species, only about 6 in. high, with a habit resembling that of *R. intricatum*. Flowers white, about ½ in. across. Western China. (J. Veitch & Sons.)

*Rhododendron sublanceolatum. (*G. C.* 1911, xlix. 338, 342, f. 157.) G. A species of the *Azalea* section, with a somewhat loose and coarse habit. Leaves ovate-lanceolate, about 2 in. long and ¾ in. broad, firm in texture and lasting 2 seasons. Flowers usually 3 together, 3–4 in. across, rose-red. Probably of Chinese origin; cultivated in Japan. (R. C. Notcutt.)

*Rhododendron sutchuenense. (*B. M.* t. 8362; *Veitch, N. H. P.* 1911, 4.) H. Allied to *R. Fortunei*, from which it differs in being altogether glabrous, and in having oblanceolate-oblong leaves. Leaves usually about 6 in. long. Flowers in a dense corymb. Calyx very small. Corolla broadly campanulate, about 3 in. across, rose-coloured, with darker spots on the upper side within. Central China. (J. Veitch & Sons.)

*Rosa Alberti. (*G. M.* 1911, 978.) Rosaceae. H. A species with long graceful shoots clothed with glaucous foliage and bearing ornamental club-shaped coral-red fruits about 1 in long, which last in good condition for a long time. Turkestan. (Kew.)

*Rubus amabilis. (*M. D. G.* 1911, 245.) Rosaceae. H. Shrub, up to about 6 ft. high, with slightly prickly branches. Leaves pinnate; leaflets usually 9, ovate, 1¼–1¾ in. long, deeply doubly serrate. Flowers solitary, terminal, more than 1¾ in. across. Fruits red, large, well-flavoured. Western China. (Arnold Arboretum, Boston, U.S.A.; H. A. Hesse, Weener, Hanover.)

*Rubus clemens. (*M. D. G.* 1911, 245.) H. Shrub with unarmed arching branches 9–20 ft. long. Leaves palmately lobed, 4–5 in. across, pale green and hairy beneath. Flowers small, rose, forming long narrow terminal panicles. Fruits black. Western China. (Arnold Arboretum; H. A. Hesse.)

Rubus macilentus. (*M. D. G.* 1911, 245.) H. Shrub, 2½–5 ft. high. Branches furnished with strong prickles. Leaves 3-foliolate, with many hooked prickles, glabrous; terminal leaflet ovate-oblong, 1¼–2 in. long; lateral small. Flowers white, mostly in threes at the ends of short lateral branches. Fruits orange. Himalaya; Western China. (Arnold Arboretum; H. A. Hesse.)

Saccolabium sarcochiloides. (*Orchis*, 1911, 61, ff. 24–30.) Orchidaceae. S. Stem short, densely leafy. Leaves subfalcate-ligulate, up to nearly 6 in. long, unequally 2-lobed at the apex. Racemes spreading, short, on short peduncles. Flowers small, lasting only a day, white, with violet-red spots on the base of the sepals and petals and orange-yellow side lobes to the lip. Philippines. (K. W. John, Andernach-on-Rhine.)

*Salvia globosa. (*R. H. B.* 1911, 29, f.) Labiatae. H. A biennial. Leaves in a flattened rosette, 16–18 in. long, 10–12 in. broad, deeply cut, clothed with a silvery-white tomentum. Flowering-stem upwards of 3 ft. high, much branched, the branches so arranged as to form a sphere. Flowers large, white. Asia Minor. (Haage & Schmidt, Erfurt.)

Sambucus canadensis f. chlorocarpa. (*Sargent, T. & S.* ii. 188.) Caprifoliaceae. H. A form with pale green fruits. New Hampshire, U.S.A. (Arnold Arboretum, Boston, U.S.A.)

*Sanseverinia rorida. (*B. P.* ix. 208, tt. 5–6; *B. T. O.* 1911, 289.) Haemodoraceae. S. A new species allied to *Sanseveria Schimperi*. Almost

stemless. Leaves 2-ranked, erect-spreading, horn-shaped, terete beneath, deeply channelled above. Scape flexuose, much longer than the leaves. Panicle elongated, with many short spreading-reflexed branches. Flowers small, subfasciculate; segments linear, obtuse, recurved. Italian Somaliland. (Palermo B. G.) [*Sanseveria.*]

Sarcochilus Ceciliae. (*O. R.* 1911, 250.) Orchidaceae. S. A dwarf tufted plant with linear or lanceolate-linear leaves, 2–3 in. long, and erect spikes, rather longer than the leaves, bearing small pink flowers. Queensland. (Sir J. Colman.)

***Sarcococca humilis.** (*K. B.* 1911, 329.) Euphorbiaceae. H. An evergreen shrub 1–1½ ft. high, of neat tufted habit. Leaves lanceolate or ovate-lanceolate, 1–3 in. long, ⅓–¾ in. broad, pointed at both ends, glabrous, leathery; petiole ⅛–¼ in. long. Flowers white, very fragrant, in short axillary racemes. Berry black, roundish, ¼ in. across. Central and Western China. (J. Veitch & Sons.)

Saussurea Veitchiana. (*K. B.* 1911, 190; *B. M.* t. 8381; *G. C.* 1911, l. 85, f. 40.) Compositae. H. Herb, 2–3 ft. high, with about 2–5 leafy stems, which are erect, rigid and floccose above. Leaves oblong-linear, the longest about 10 in. long and 2 in. broad, sheathing at the base, toothed, undulate, loosely hairy beneath; upper leaves ovate-lanceolate, gradually smaller, passing into blush-coloured or purplish bracts. Flower-heads nearly ovoid, over 1 in. long, about ¾ in. broad. Florets deep purplish-black. Central China. (J. Veitch & Sons; Glasnevin B. G.)

***Saxifraga Aizoon baldensis.** (*G. C.* 1911, xlix. 251.) Saxifragaceae. H. A form characterised by having rosettes of leaves only about ½ in. across and young shoots bright crimson in colour. Leaves short, thick, markedly dentate, rounded at the apex. Monte Baldo, North Italy. (R. Farrer.)

Saxifraga bursiculata. (*G. C.* 1911, xlix. 141, 158, f. 71; *Gard.* 1911, 154, f.) H. A garden hybrid between *S. Burseriana major* and *S. apiculata.* (E. H. Jenkins.)

***Saxifraga Godseffiana.** (*G. C.* 1911, xlix. 228.) H. A garden hybrid between *S. sancta* and *S. Elizabethae*, hitherto known as *Saxifraga* "L. S. Godseff." (Bees, Ltd.)

***Saxifraga Haagii.** (*G. C.* 1911, xlix. 343.) H. A garden hybrid between *S. sancta* and *S. Ferdinandi-Coburgi.* (F. Sundermann, Lindau, Bavaria.)

Saxifraga kestoniensis. (*G. C.* 1911, xlix. 74,107.) H. Supposed to be a hybrid derived from *S. Burseriana.* (G. Reuthe.)

***Saxifraga laevis.** (*G. C.* 1911, xlix. 343.) H. Habit spreading like that of *S. aizoides.* Leaves narrowly elliptic-ovate, in loose rosettes. Stems about 2 in. high, tinged with crimson on the lower part, bearing 4–6 rather small rich yellow flowers. Caucasus. (Kew.)

***Saxifraga lingulata** var. **australis.** (*K. B.* 1911, 130, f. 2.) H. Very variable in the shape and size of the leaves which are sometimes long, broadly linear or linear-spathulate, and sometimes short and broadly spathulate, like those of the variety *lantoscana*, but broader. = *S. australis*, Moric. Italy and Sicily. (Miss Willmott.)

***Saxifraga pungens** (*G. C.* 1911, xlix. 343.) H. A garden hybrid between *S. Rorheliana* and *S. juniperifolia.* (F. Sundermann, Lindau, Bavaria.)

***Saxifraga Sundermannii.** (*G. C.* 1911, xlix. 228, f. 101.) H. A garden hybrid between *S. Burseriana* and *S. marginata*, with a closer resemblance to the former, while *S. Obristii*, of the same parentage, is more nearly allied to the latter. (F. Sundermann, Lindau, Bavaria.)

Sedum allantoides. (*M. G. Z.* 1911, 76, f. 14.) Crassulaceae. G. A bushy plant 8–12 in. high, becoming woody, with hoary branches, leaves and inflorescence. Leaves cylindric or almost clubshaped, curved, ¾–1¾ in. long, ⅓–½ in thick, rounded at the apex. Flowers small, greenish-white or somewhat reddish, in a much branched panicle. Mexico. (Darmstadt B. G.)

***Sedum pilosum.** (*G. C.* 1911, xlix. 347, f. 160.) H. Leaves thick, succulent, in rosettes nearly 1 in. across, several of which are formed by one plant. Stems about 3 in. high, rather densely covered with finely pubescent leaves. Flowers pink, in much branched corymbs 2 in. across. Caucasus. (Regel & Kesselring, St. Petersburg.) [Syn. *S. Regelii*, Hort., not of Kuntze.]

***Senecio Heritieri.** (*G. C.* 1911, l. 333, f. 142.) Compositae. G. Rarely more than 1 ft. high, with a straight

stem terminated by a rather large solitary flower-head. Leaves 5- or 7-lobed, white-tomentose beneath. Ray-florets rather narrow, widely separated at the tips. A re-introduction. Under the name of *Cineraria lanata* it was figured in *B. M.* t. 53 (1788). (For the plant generally grown as *S. Heritieri* the name *S. hortensis* is proposed. This is believed to be a hybrid between *S. Heritieri* and *S. populifolius*.) Teneriffe. (Sutton & Sons.)

Senecio Prainianus. (*G. C.* 1911, l. 82.) G. A new species resembling *S. Petasitis* in habit. Shrub about 3 ft. high, with ornamental foliage. Leaves rather fleshy, suborbicular, 5–7 in. broad, palmately lobed, cordate at the base, roughish above, pubescent on the prominent nerves beneath; petioles above 4 in. long. Inflorescence a drooping much branched elegant panicle. Flower-heads at first yellow, fading to brown; florets all tubular. Mexico. (La Mortola, Ventimiglia, Italy.)

***Senecio saxifragoides.** (*B. M.* t. 8394.) H. or H. H. A perennial herb with a stout rootstock and a densely woolly crown. Leaves radical, petioled, broadly oblong-elliptic or nearly orbicular, 3–5 in. long, 1¾–4 in. broad, hoary-woolly beneath. Scapes up to 1 ft. high, branched. Flower-heads numerous, yellow, 1½ in. across, corymbosely arranged. New Zealand. (Kew.)

Sobralia Malmquistiana. (*Orchis*, 1911, 59, ff. 10–16.) Orchidaceae. S. Similar to *S. macrantha* in habit, but its leaves are broader and thicker. Flowers pale rose, with an orange-yellow blotch on the lip. Sepals oblong, nearly 4 in. long. Petals obliquely elliptic, about as long as the sepals. Lip broadly obovate, 3½ in. long, undulate-crisped on the margin. Probably Colombia. (Herrenhausen Berggarten.)

***Solandra Hartwegii.** (*G. C.* 1911, xlix. 383, f. 173; *K. B.* 1911, 345.) Solanaceae. G. A new species which has been confused with *S. grandiflora*. A shrub, with lustrous green smooth leaves similar in shape to those of S. grandiflora, but usually more acuminate. Flowers fragrant. Corolla funnel-shaped, fleshy, lasting 2 days, at first rich yellow, finally changing to orange, 6–8 in. across the mouth; tube greenish, 5 in. long. Mexico. (Glasnevin B. G.)

Sophro-cattleya Wellesleyae. (*G. C.* 1911, xlix. 107; *O. R.* 1911, 152.) Orchidaceae. G. A garden hybrid between *Cattleya labiata* and *Sophronitis grandiflora*. (R. G. Thwaites; J. Cypher & Sons.)

Sorbus plantierensis. (*Späth Cat.* 1911–12, n. 148, 127.) Rosaceae. H. Apparently a hybrid between *S. Aria* and *S. americana*. (Simon-Louis frères, Plantières, Metz.)

***Stapelia similis.** (*K. B.* 1911, 358.) Asclepiadaceae. S. Stems erect, 3–6 in. long, 4–6-angled, somewhat toothed on the angles. Flowers 3-6 arising at the base of the stems. Corolla rotate, ¾ in. across, dark purple; lobes ovate, acute. Little Namaqualand. (Kew.)

Statice Pseudo-armeria mauritanica. (*Jard.* 1911, 383.) Plumbaginaceae. H. Leaves spreading, forming a rosette. Stems numerous, straight, each bearing a large head of rose-coloured flowers. (Vilmorin-Andrieux & Co, Paris.)

Symbegonia fulvo-villosa. (*B. M.* t. 8409.) Begoniaceae. S. An erect herb, 5–8 in. high. Leaves lanceolate-oblong, very unequal at the base, 2½–2¾ in. long, 1¼ in. broad, deeply double-serrate. Flowers 1-sexual, shortly pedicelled, the male with 2 free ovate segments and 12–20 stamens, and the female with the segments united in a pale yellow campanulate tube, 5 serrulate spreading lobes, and an inferior 3-winged ovary. New Guinea. (Glasnevin B. G.)

Symphoricarpos sinensis. (*Pl. Wils.* 117.) Caprifoliaceae. H. An erect quite glabrous shrub 3–6 ft. high. Leaves oval or rhombic-ovate, ⅔–1 in. long, ½–¾ in. broad, quite entire. Flowers sessile, solitary in the axils of short subulate bracts, forming 6–12-flowered terminal spikes. Corolla white, 3½ lin. long. Fruit ovoid, 3½ lin. long, dark blue. Central China. (Arnold Arboretum, Boston, U.S.A.)

Tilia grandifolia lutescens. (*M. D. G.* 1911, 424.) Tiliaceae. H. Leaves at first pale golden-yellow, afterwards light yellow-green. (E. Grone-Braukmann, Scheda, Wickede, Germany.)

***Torenia atropurpurea.** (*B. M.* t. 8388; *G. C.* 1911, l. 334.) Scrophulariaceae. S. A very distinct species. Leaves ovate or deltoid-ovate, ⅔–1½ in. long, ⅓–¾ in. broad, shortly stalked, serrate. Flowers usually solitary on peduncles at the ends of the branches. Calyx narrow, wingless. Corolla dark purple, 1½ in. long; tube narrow at the base, much exserted, enlarged and curved above; limb about 1 in. across,

with 4 rounded lobes. Malay Peninsula. (Kew.)

Trichopilia Gouldii. (*G. C.* 1911, l. 422; *G. M.* 1911, 937.) Orchidaceae. G. A garden hybrid between *T. sauvis* and *T. fragrans*. (Charlesworth & Co.)

Ulmus effusa rubescens. (*M. D. G.* 1911, 423.) Urticaceae. H. This form has its leaves coloured a beautiful blood-red in the autumn, while in the form *typica* they are yellowish. (F. Graf von Schwerin, Wendisch-Wilmersdorf, Germany.)

Ulmus Plotii. (*G. C.* 1911, l. 408, ff. 165–166.) H. A new name applied to a species which was growing in a park at Hanwell in Oxfordshire in 1667 and is now found wild in several counties in England. It is a tall very graceful tree, sometimes over 80 ft. high, with small narrow acuminate glabrous leaves, usually about 2 in. long and 1 in. broad. It has been recorded as Lock's Elm (*U. sativa* var. *Lockii*, Druce.) [In G. C. 1912, li. 199, 216, *U. Plotii* is referred to *U. sativa*, Mill.]

Urbinia Purpusi. (*M. G. Z.* 1911, 76, ff. 12–13.) Crassulaceae. G. Resembles a species of *Haworthia* in its leaves which are almost flat above, more or less keeled beneath, ending in a fine point, and arranged in small dense rosettes. Inflorescence rather long. Flowers few, campanulate, yellow-red, yellow at the tips. Mexico. (Darmstadt B. G.)

Vanda Amesiana albens. (*G. C.* 1911, l. 462.) Orchidaceae. S. Flowers almost entirely white. (Stuart Low & Co.)

Vanda coerulea var. **Wrigleyi.** (*O. R.* 1911, 62.) S. Flowers rather smaller than in the type. Sepals and petals somewhat narrower, pure white. Lip rose-pink. Spur rather long and slender. Possibly a natural hybrid. (O. O. Wrigley.)

Vanda Kimballiana alba. (*G. C.* 1911, l. 312; *G. M.* 1911, 819.) G. Flowers white, with a yellow base to the lip. (Mansell & Hatcher.)

***Veronica filifolia.** (*G. C.* 1911, xlix. 250.) Scrophulariaceae. H. A graceful little plant with narrow leaves and small china-blue flowers. Russia. (S. Arnott.)

Veronica Veitchii. (*G. C.* 1911, l. 391; *G. M.* 1911, 801, f.) H. H. A garden hybrid of which the parentage is not recorded. It is a shrubby plant with large shining green leaves and spikes of rich blue flowers. (R. Veitch & Son.)

Viburnum betulifolium. (*Sargent, T. & S.* ii. 99, t. 147; *M. D. G.* 1911, 245.) Caprifoliaceae. H. Leaves deciduous, ovate to rhombic-ovate, 1¼–2½ in. long, ¾–1¾ in. broad, coarsely toothed, nearly glabrous, petiole 5–7½ lin. long, with 2 small stipules near the base. Corymbs terminal, umbel-like, 2½–4 in. across. Flowers less than ¼ in. across. Fruits red. Central and Western China. (Arnold Arboretum, Boston, U.S.A.; H. A. Hesse, Weener, Hanover.)

Viburnum brevipes. (*Pl. Wils.* 113.) H. Nearest allied to *V. dilatatum* from which it is distinguished by its shorter petioles and narrower leaves, the underside of which are fasciculate-pilose chiefly on the veins, not clothed with usually forked hairs. Central China. (Arnold Arboretum, Boston, U.S.A.)

Viburnum foetidum var. **rectangulum.** (*M. D. G.* 1911, 245; *Sargent, T. & S.* ii. 114.) H. Shrub. 5–13 ft. high, with long pendulous branches. Leaves elliptic to oblong, 1¾–2½ in. long, almost glabrous, entire or with a few coarse teeth near the apex. Corymbs nearly sessile. Fruits red. Central China. (Arnold Arboretum; H. A. Hesse.)

***Viburnum Davidii.** (*G. C.* 1911, xlix. 317; *Gard.* 1911, 204.) H. An evergreen species. Leaves ovate, 4–6 in. long, 1¾–2¼ in. broad, toothed, glossy, strongly 3-nerved. Flowers small, white, in corymbs. Fruits small, oval, blue. Western and Central China. (J. Veitch & Sons.)

Viburnum hupehense. (*Sargent, T. & S.* ii. 116; *Späth Cat.* 1911–12, n. 148, 137.) H. Nearly related to *V. dilatatum* but is distinguished by its orbicular-ovate stipulate leaves. It differs from *V. betulifolium* by having its leaves pubescent on both sides. Central China. (L. Späth, Berlin.)

Viburnum Wilsonii. (*Sargent, T. & S.* ii. 115; *M. D. G.* 1911, 245.) H. Leaves membranous, ovate, long-acuminate, 1¾–3¼ in. long, 1–1¼ in. broad, toothed, more or less hairy; petiole 5–7½ lin. long, hairy. Corymbs terminal, about 2 in. across, covered with a yellowish velvety pubescence. Flowers less than ¼ in. across. Central

China. (Arnold Arboretum; H. A. Hesse.)

Viola Munbyana alba. (*R. H.* 1911, 285.) Violaceae. H. A variety with very erect stems and white flowers. (Cayeux & Le Clerc, Paris.)

Wistaria chinensis vars. (*M. D. G.* 1911, 239–240.) Leguminosae. H. In addition to those of the two varieties specified below, descriptions are given of several varieties or forms of *W. chinensis*, some of which are already well-known in gardens as distinct species or as varieties with other names. The variety *albiflora* appears to be the same as the variety *alba*, and *monstrosa* the same as *flore pleno*.

Wistaria chinensis aucubaefolia. (*M. D. G.* 1911, 239.) H. Leaves rather narrow, unequally blotched with a beautiful pale yellow. Flowers blue. Central China. (C. Sprenger, Naples.)

Wistaria chinensis Demckerii. (*M. D. G.* 1911, 239.) H. A very free-flowering variety, with pale bronze-coloured young leaves and blue flowers. Central China. (C. Sprenger, Naples.)

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX IV.—1912.

LIST of STAFFS of the ROYAL BOTANIC GARDENS, Kew, and of Botanical Departments, Establishments and Officers at Home, and in India and the Colonies, in Correspondence with Kew.

* Trained at Kew. † Recommended by Kew.

Royal Botanic Gardens, Kew.—

Director - - - - -	Lieut.-Col. Sir David Prain, I.M.S., C.M.G., C.I.E., M.A., M.B., LL.D., F.R.S., F.L.S.
Assistant Director - - -	Arthur W. Hill, M.A., F.L.S.
Assistant (Office) - - -	*John Aikman.
,, ,, - - -	*William Nicholls Winn.

Keeper of Herbarium and Library	Otto Stapf, Ph.D., F.R.S., F.L.S.
Assistant Keeper (Cryptogams) -	George Massee, F.L.S.
,, ,, (Phanerogams)-	Charles Henry Wright, A.L.S.
,, ,, (Herbarium) -	Nicholas Edward Brown, A.L.S.
,, (Herbarium) - -	*Robert Allen Rolfe, A.L.S.
,, ,, - -	*Sidney Alfred Skan.
,, ,, - -	Thomas Archibald Sprague, B.Sc., F.L.S.
,, ,, - -	Arthur Disbrowe Cotton, F.L.S.
,, ,, - -	Jessie Jane Clark, B.Sc.
,, ,, - -	Elsie Maud Wakefield, F.L S.
,, for Tropical Africa -	*John Hutchinson.
,, for India - - -	William Grant Craib, M.A.

Assistant Keeper (Jodrell Laboratory).	Leonard Alfred Boodle, F.L.S.

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Royal Botanic Gardens, Kew—*continued.*

Keeper of Museums - - -	John Masters Hillier
Assistant (Museums) - - -	*John H. Holland, F.L.S.
" " - - -	*William Dallimore.
Preparer - - - - -	George Badderly.
Curator of the Gardens - -	William Watson, A.L.S.
Assistant Curator - - -	*William J. Bean.
Foremen :—	
Herbaceous Department - -	*Walter Irving.
Arboretum - - - -	*Arthur Osborn.
Greenhouse and Ornamental Department.	*John Coutts.
Tropical Department - -	*Charles P. Raffill.
Temperate House - - -	*William Taylor.
Storekeeper - - - -	*George Dear.

Aberdeen.—University Botanic Garden :—

Professor - - -	J. W. H. Trail, M.A., M.D., F.R.S., F.L.S.

Cambridge.—University Botanical Department :—

Professor - - -	A. C. Seward, M.A., F.R.S., F.L.S.
Curator, University Herbarium.	C. E. Moss, D.Sc.
Curator, University Museum.	H. H. Thomas, B.A.
Curator of Garden -	*Richard Irwin Lynch, M.A., A.L.S.

Dublin.—Royal Botanic Gardens, Glasnevin :—

Keeper - - -	Sir Frederick W. Moore, M.A., F.L.S.
Assistant - - -	*C. F. Ball.

Trinity College Botanic Gardens :—

Professor - - -	H. H. Dixon, Sc.D., F.R.S.

Edinburgh.—Royal Botanic Garden :—

Regius Keeper - -	I. B. Balfour, M.A., M.D., LL.D., Sc.D., F.R.S., F.L.S.
Assistant to Regius Keeper.	W. W. Smith, M.A.
Assistant (Museum) -	H. F. Tagg, F.L.S.
" (Herbarium)	*J. F. Jeffrey.
Head Gardener - -	*R. L. Harrow.
Assistant Gardener -	Henry Hastings.

Glasgow.—Botanic Gardens :—

University Professor -	F. O. Bower, M.A., Sc.D., F.R.S., F.L.S.
Curator - - -	James Whitton.

Oxford.—University Botanic Garden :—

Professor - - -	Sydney H. Vines, M.A., Sc.D., F.R.S., F.L.S.
Curator - - -	*William Baker

AFRICA.

British East Africa Protectorate.—

Nairobi -	Director of Agriculture.	Hon. A. C. Macdonald.
	Assistant - - -	*Henry Powell.
	Conservator of Forests	E. Battiscombe.

Cape Colony.—

Cape Town -	Professor of Botany, South African College.	H. H. W. Pearson, M.A., Sc.D., F.L.S.
	Curator, Bolus Herbarium.	Mrs. F. Bolus.
	Conservator of Forests	J. S. Lister, I.S.O.

Gardens and Public Parks :—

Superintendent - -	*G. H. Ridley.

Grahamstown.—Albany Museum :—

Superintendent of Herbarium.	S. Schönland, Ph.D., F.L.S.

Gardens and Public Parks :—

Curator - - -	E. J. Alexander.
Port Elizabeth - Superintendent - -	John T. Butters.
King Williamstown. Curator - - -	George Lockie.
Graaff-Reinet - „ - - -	*C. J. Howlett.
Uitenhage - „ - - -	H. Fairey.

Egypt.—

Cairo.—Department of Agriculture :—

Director-General -	Gerald C. Dudgeon, F.E.S.
Botanist - - -	W. Lawrance Balls, M.A.
„ - - -	B. G. C. Bolland, B.A.
Assistant Botanist -	F. S. Holton.
Director of Horticulture.	*T. W. Brown.
Assistant Director -	——

Alexandria.—Horticultural Society :—

Secretary - - -	D. S. Fish.

Gold Coast.—Botanic and Agricultural Department :—

Director of Agriculture.	W. S. D. Tudhope.
Travelling Instructor	*Alfred E. Evans.
Curator - - -	*A. C. Miles.
„ - - -	C. Saunders.
„ - - -	M. D. Reece.
„ - - -	*A. R. Gould.
„ - - -	*T. Hunter.
„ - - -	*G. H. Eady.
„ - - -	*E. W. Morse.
Conservator of Forests -	N. C. McLeod.

Natal.—Botanic Gardens :—

Durban - -	Director - - -	John Medley Wood, A.L.S.
	Curator - - -	*James Wylie.

Northern Nigeria.—Agricultural Department :—

Director of Agriculture.	P. H. Lamb.

Nyasaland Protectorate.—

Agricultural and Forestry Department :—

Zomba - -	Director of Agriculture.	J. S. J. McCall.
	Agriculturist - -	*E. W. Davy.
	Chief Forest Officer -	*J. M. Purves.

Orange River Colony.—Department of Agriculture :—

Botanist - - -	E. J. MacMillan.
Chief of Forestry Division.	K. A. Carlson.

Rhodesia.—

Bulawayo.—Rhodes Matopos Park :—

Curator - - -	W. E. Dowsett.

Salisbury.—Department of Agriculture :—

Director - - -	E. A. Nobbs, Ph.D., B.Sc.
Agriculturist and Botanist.	H. G. Mundy, F.L.S.

Sierra Leone.—Agricultural Department :—

Director of Agriculture.	W. Hopkins.

Soudan.—

Khartoum -	Director of Woods and Forests.	——
	Superintendent of Palace Gardens.	*F. S. Sillitoe.
Jebelin - -	Superintendent of Experimental Plantations.	*T. Cartwright.

Southern Nigeria.—Agricultural Department :—

Director of Agriculture.	*W. H. Johnson, F.L.S.
Assistant Director -	S. V. Henderson.
Mycologist- - -	†C. O. Farquharson.
Superintendent of Agriculture.	R. Nicol.
,, ,,	*F. Evans.
Assistant Superintendent.	*R. Gill.
,, ,,	A. J. Findlay.
,, ,,	— Burr.
,, ,,	— Owen.
Curator - - -	*T. D. Maitland.
,, - - -	*A. B. Culham.
Conservator of Forests - -	H. N. Thompson.

Transvaal.—Department of Agriculture :—

Pretoria - -	Botanist - - -	J. Burtt Davy, F.L.S.
	Mycologist - -	†I. B. Pole Evans, B.Sc., F.L.S.
	Conservator of Forests -	C. E. Legat.

Uganda.—

Entebbe—Agricultural Department :—

	Director of Agricultural -	S. Simpson.
	Botanist - - -	W. Small, B.Sc.
	Assistant - - -	*J. D. Snowden.
	Botanical, Forestry and Scientific Department :—	
	Assistant - - -	*Robert Fyffe.

Zanzibar - -	Director of Agricultural -	F. C. McClellan, F.L.S.

AUSTRALIA.

New South Wales.—Botanic Gardens :—

Sydney - -	Director and Government Botanist.	J. H. Maiden, F.L.S.
	Superintendent -	George Harwood.
	Botanical Assistant -	E. Betche.
University Professor of Botany -		A. A. Lawson, B.Sc., Ph.D., F.L.S.

Technological Museum :—

	Curator - - -	R. T. Baker, F.L.S.
Chief Forest Officer - - -		R. D. Hay.

Queensland.—

Brisbane - -	Colonial Botanist -	F. M. Bailey, C.M.G., F.L.S.

Botanic Gardens :—

	Director - - -	J. F. Bailey.

Acclimatisation Society's Gardens :—

	Secretary and Manager	W. Soutter.
	Overseer - - -	James Mitchell.

Forest Department :—

	Director - - -	N. W. Jolly, B.Sc.

Cairns.—Kamerunga State Nursery :—

	Manager - - -	Howard Newport.
	Overseer - - -	C. E. Wood.
Rockhampton -	Superintendent - -	R. Simmons.

South Australia.—

Adelaide.—University Professor of Botany.		T. G. B. Osborn, M.Sc.

Botanic Gardens :—

	Director - - -	Maurice Holtze, Ph.D., F.L.S.
Port Darwin -	Curator - - -	Nicholas Holtze.

Woods and Forests :—

	Conservator - -	Walter Gill, F.L.S.

Tasmania.—

Hobart - -	Government Botanist	Leonard Rodway
	Chief Forests Officer -	J. C. Penny.
	Botanic Gardens :—	
	Officer-in-charge -	Robert Hall.

Victoria.—Botanic Gardens :—

Melbourne -	Curator - - -	J. Cronin.
	National Herbarium :—	
	Government Botanist and University Professor of Botany.	A. J. Ewart, D.Sc., Ph.D., F.L.S.
	Conservator of Forests - - -	H. R. Mackay.

BERMUDA.

Botanic Station :—

Superintendent - - - - ——

BRITISH HONDURAS.

Botanic Station :—

Curator - - - - - - Eugene Campbell.

CANADA.

Ottawa - -	Director of Government Experimental Farms.	J. H. Grisdale.
	Dominion Horticulturist and Curator of Botanic Garden.	W. T. Macoun.
	Dominion Botanist -	H. T. Güssow.
	Assistant - - -	J. W. Eastham, B.Sc.
	,, - - -	F. Fyles, B.A.

CEYLON.

Peradeniya.—Royal Botanic Gardens :—

Director of Agriculture - - -	R. N. Lyne, F.L.S.
Superintendent - - - - -	——
Government Mycologist - - -	†T. Petch, B.A., B.Sc.
Superintendent, Experiment Station	——
Curator - - - - - -	*Hugh F. Macmillan, F.L.S.
Superintendent of School Gardens -	C. Drieberg, B.A.
Hakgala - - Curator - - -	*J. J. Nock.
Heneratgoda - Conductor - -	D. F. de S. Gunaratna.

Maha-iluppalama.—Experiment Station :—

Superintendent - -	C. Harbord.
Nuwara Eliya - Conductor - -	T. Young.
Conservator of Forests - - -	T. J. Campbell.

CYPRUS.

Principal Forest Officer - -	A. K. Bovill.
Director of Agriculture - -	——
Assistant Director - - -	W. Bevan.

FALKLAND ISLANDS.

Government House Garden :—

Head Gardener - - - - -	*A. W. Benton.

FIJI.

Superintendent of Agriculture - -	Charles H. Knowles.

Botanic Station :—

Curator - - - - - -	*Daniel Yeoward.

HONG KONG.

Botanic and Forestry Department :—

Superintendent - - - -	*W. J. Tutcher, F.L.S.
Assistant Superintendent - - -	*H. Green.

MALTA.

Argotti Botanic Garden :—
Director - - - - - - Francesco Debono, M.D.

MAURITIUS.

Pamplemousses.—Department of Agriculture :—
Director - - - - F. A. Stockdale B.A., F.L.S.
Department of Forests and Botanic Gardens :—
Director - - - - - Paul Koenig.
Assistant Director - - - P. de Sornay.
1st Assistant - - - - S. E. Pougnet.
2nd „ - - - - F. Bijoux.
Reduit - - Overseer - - - W. A. Kennedy.
Forest Officer - - - - - F. Gleadow.

NEW ZEALAND.

Wellington.—Department of Agriculture :—
Biologist - - - - T. W. Kirk.
State Forest Department :—
Chief Forester - - - Henry John Matthews.
Colonial Botanic Garden :—
Head Gardener - - - ——

Dunedin - - Superintendent - - *D. Tannock.
Napier - - „ - - W. Barton.
Invercargill - Head Gardener - - ——
Auckland - Ranger - - - William Goldie.
Christchurch - Head Gardener - - *Ambrose Taylor.

SEYCHELLES.

Botanic Station :—
Curator - - - - - - P. R. Dupont, F.L.S.

STRAITS SETTLEMENTS.

Straits Settlements.—Botanic Gardens :—
Singapore - Director - - - †I. H. Burkill, M.A., F.L.S.
Assistant Superintendent - *R. Derry.
„ „ *J. W. Anderson.

Federated Malay States.—Forest Department :—

	Conservator - -	A. M. Burn-Murdoch.

Kuala Lumpur.—Agricultural Department :—

Director of Agriculture.	†L. Lewton-Brain, B.A., F.L.S.
Mycologist - -	†C. K. Bancroft, B.A.
Agriculturist - -	†F. G. Spring.
Assistant Mycologist -	†E. Bateson.
,, ,,	†A. Sharples.
Economic Botanist -	N. W. Barrett, B.A.

Perak (Taiping).—Government Gardens and Plantations :—

Superintendent - -	*W. L. Wood.

Selangor and Negri Sembilan.—

Assistant Superintendent.	*J. Lambourne.

WEST INDIES.

Imperial Department of Agriculture :—

Barbados - -	Commissioner - -		Francis Watts, C.M.G., D.Sc., F.I.C., F.C.S.
	Scientific Assistant -		A. H. Kirby, B.A.
	Mycologist and Agricultural Lecturer.		†F. W. South, B.A.
Antigua.—Government Chemist and Superintendent of Agriculture, Leeward Islands.			H. A. Tempany, B.Sc., F.I.C., F.C.S.
Botanic Station :—			
	Curator - -		*T. Jackson.
	Agricultural Assistant		C. A. Gomes.
	,, ,,		S. V. Athill.
Barbados.—Department of Agriculture.			
	Superintendent -		John R. Bovell, I.S.O., F.L.S., F.C.S.
	Assistant Superintendent.		W. Nowell.
Dominica.—Botanic Station :—			
	Curator -		*Joseph Jones.
	Assistant Curator -		G. A. Jones.
Grenada.—Botanic Garden :—			
	Agricultural Superintendent.		G. G. Auchinleck, B.Sc.
	Agricultural Instructor		G. F. Branch.
Montserrat.—Botanic Station :—			
	Curator - -		*W. Robson.

St. Kitts-Nevis.—Botanic Station :—

Agricultural Superintendent.	F. R. Shepherd.
Acting Agricultural Instructor, Nevis.	W. I. Howell.

St. Lucia.—Botanic Station :—

Agricultural Superintendent.	*John Chisnall Moore.
Assistant Superintendent.	*A. J. Brooks.

St. Vincent.—Botanic Station :—

Agricultural Superintendent.	*W. N. Sands.
Assistant Superintendent.	*F. Birkinshaw.

Virgin Islands.—

Agricultural Instructor.	*W. C. Fishlock.

Bahamas.—Botanic Station :—

Curator - - -	W. M. Cunningham.

British Guiana.—Department of Science and Agriculture :—

Georgetown -	Director - - -	Prof. J. B. Harrison, C.M.G., M.A., F.I.C., F.C.S.
	Assistant Director and Government Botanist.	——
	Forestry Officer -	C. W. Anderson, I.S.O.
	Head Gardener -	†John F. Waby, F.L.S.
	Assistant Gardener -	F. Greeves.
	Agricultural Superintendent.	*Robert Ward.

Jamaica.—Department of Agriculture :—

	Director - - -	Hon. H. H. Cousins, M.A., F.C.S.
	Travelling Instructor	*William Cradwick.
	,, ,,	James Briscoe.
Hope Gardens and Experiment Station, Hill, Parade, and Castleton Gardens.	Superintendent -	*William Harris, F.L.S.
King's House Garden.	,, -	*William J. Thompson.

Tobago.—Botanic Station :—

Curator - - - - -	*W. E. Broadway.

Trinidad.—Department of Agriculture :—

Director - - -	Prof. P. Carmody, F.I.C., F.C.S.
Assistant Director and Government Botanist.	W. G. Freeman, B.Sc., F.L.S.
Curator, Royal Botanic Gardens.	——
Mycologist - - -	J. B. Rorer, M.A.
Forest Officer - - -	C. S. Rogers.

INDIA.

Botanical Survey of India :—

Director - - - - -	Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.
Economic Botanist - - -	——
Curator, Industrial Section, Indian Museum.	D. Hooper, F.L.S.
Assistant for Phanerogamic Botany	S. C. Banerji, M.A., B.Sc.
,, ,, ,,	M. S. Ramaswami, B.A.

Departments of Agriculture, Botanical Officers attached to :—

Imperial Agricultural Research Institute, Pusa, Bengal :—

Mycologist - - - -	†E. J. Butler, M.B., F.L.S.
Economic Botanist - -	A. Howard, M.A., F.L.S.
Supernumerary Botanist -	——

Bengal Agricultural Department, Calcutta :—

Economic Botanist - -	E. J. Woodhouse, B.A., F.L.S.

Bombay Agricultural College, Poona :—

Economic Botanist - -	†W. Burns, B.Sc.

Central Provinces Agricultural Department, Nagpur :—

Economic Botanist - -	†R. J. D. Graham, M.A., B.Sc.

Departments of Agriculture, Botanical Officers attached to—*continued.*

Madras Agricultural Department :—

Government Botanist	†C. A. Barber, M.A., Sc.D., F.L.S.
Mycologist	†W. McRae, M.A., B.Sc.

Punjab Agricultural Department, Lyallpur :—

Economic Botanist	†D. Milne, B.Sc.

Agricultural College, Cawnpur, United Provinces :—

Economic Botanist	†H. M. Leake, M.A., F.L.S.

Eastern Bengal and Assam Agricultural Department :—

Economic Botanist	P. G. Hector, B.Sc.

BENGAL.

Calcutta.—Royal Botanic Garden, Sibpur :—

Superintendent	Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.
Curator of Herbarium	†C. C. Calder, B.Sc.
Curator of Garden	*G. T. Lane.
Overseer	A. G. Laurence.
Probationer	*W. V. North.

Gardens in Calcutta :—

Assistant Curator	*J. T. Johnson.
Overseer	S. N. Bose.

Agri-Horticultural Society of India :—

Secretary	F. Abbott.
Superintendent	P. Lancaster.

Darjeeling.—Lloyd Botanic Garden :—

Superintendent	Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.
Curator	*G. H. Cave.

Cinchona Department.—

Superintendent of Cinchona Cultivation.	Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.

Mungpoo Plantation :—

Manager	*P. T. Russell.
Overseer	W. Cousins.

Munsong Plantation :—

Manager	*H. F. Green.
Assistant Manager	*H. Thomas.
Overseer	G. Holl.

BOMBAY.

Bombay City.—Municipal Garden :—

Superintendent - - - - C. D. Mahaluxmivala.

Ghorpuri.—Botanic Garden :—

Superintendent - - - - P. G. Kanetkar.

Poona.—Government Gardens :—

Superintendent - - - - *E. Little.

CENTRAL PROVINCES.

Nagpur.—Public Gardens :—

Superintendent - - - - *J. E. Leslie.

MADRAS.

Madras City.—Agri-Horticultural Society :—

Hon. Secretary - - - - P. F. Fyson, B.A., F.L.S.
Superintendent - - - - H. E. Houghton, F.L.S.

Ootacamund.—Government Gardens and Parks :—

Curator - - - - - *F. H. Butcher.

Cinchona Department.—

Director of Cinchona Plantations - W. M. Standen.
Superintendent, Dodabetta Plantation. - H. V. Ryan.
Superintendent, Nedivattam and Hooker Plantations. - E. Collins.

PUNJAB.

Delhi.—Historic and other Gardens :—

Superintendent - - - - *R. H. Locke.

Lahore.—Government Gardens :—

Superintendent - - - - *A. Hardie.

Agri-Horticultural Gardens :—

Superintendent - - - - *W. R. Mustoe.

Simla.—Vice-regal Estate Gardens :—

Superintendent - - - *Ernest Long.

NORTH-WEST FRONTIER PROVINCE.

Agri-Horticulturist - - - W. R. Brown.

UNITED PROVINCES OF AGRA AND OUDH.

Agra.—Taj and other Gardens :—
Superintendent - - - - *A. E. P. Griessen.

Allahabad.—Government Gardens :—
Superintendent - - - - *W. Head.

Cawnpur.—Memorial and other Gardens :—
Superintendent - - - - *R. Badgery.

Kumaon.—Government Gardens :—
Superintendent - - - - *Norman Gill, F.L.S.

Lucknow.—Horticultural Gardens :—
Superintendent - - - - *H. J. Davies.
Probationer - - - - *E. E. Mawer.

Saharanpur.—Government Botanic Gardens :—
Superintendent - - - - *A. C. Hartless.

Dehra Dun.—Imperial Forest Research Institute :—
Imperial Forest Botanist - - R. S. Hole, F.L.S.

EASTERN BENGAL AND ASSAM.

Dacca (Ramna).—Arboricultural Expert. *R. L. Proudlock.

NATIVE STATES.

Mysore (Bangalore) :—
Economic Botanist - - - *G. H. Krumbiegel.

Baroda :—
Superintendent - - - - *B. Cavanagh.

Travancore (Trivandrum) :—
Director - - - - Major F. W. Dawson.

Udaipur :—
Superintendent - - - - T. H. Storey.